Digital Signs – Enlightening the Regulations

City of Las Cruces

Community Development
Interoffice Memorandum

To: Terrence Moore, City Manager

From: Cheryl Rodriguez, Development Services Administrator

Through: David Weir, Community Development Director

Subject: Digital Signs – Enlightening the Regulations

Date: June 4, 2010 M-10-122

The use of digital technology is becoming more prevalent with off-premise billboards and on-premise signs. In 2009, City staff brought forward an amendment to the Las Cruces Sign Code that introduced language on how to regulate, not prohibit, the use of digital technology for both off-premise and on-premise signs. The purpose of this memorandum is to provide the Las Cruces City Council with a comprehensive look at regulations and position statements for digital signs so the Las Cruces City Council may provide direction on proposed regulatory requirements the use of digital signs within the City of Las Cruces.

1999 Comprehensive Plan

The Urban Design Element of the 1999 Comprehensive Plan is a guide to the physical development of the City in terms of preservation, growth, change, and aesthetic qualities (see Attachment "A"). The goals, objectives, and policies of the Urban Design Element support the Urban Design Goal of the 1999 Comprehensive Plan which is to "preserve and enhance our natural, visual, and historical/cultural resources." Written policy supports and addresses:

- Fostering a unique and attractive character for Las Cruces to support an image which is distinct from surrounding communities;
- Preserving and enhancing Las Cruces' natural, visual, and historical/cultural resources while reinforcing an overall urban form and character that communicates sensitivity to its physical setting; and
- Maintaining sensitivity to the City's image through the careful application of aesthetic and environmental guidelines to its neighborhoods and districts.

LCMC Chapter 36 – Sign Code

The City's Sign Code is the regulations which puts into law the policy and direction outlined in the Urban Design Element of the 1999 Comprehensive Plan. According to Section 36-1 "Purpose":

> The purpose of the Sign Code is to permit signs that will not, by their size, location, or construction, endanger the public health and safety of individuals or confuse, mislead, or obstruct the vision necessary for traffic safety. Furthermore, it is the purpose of the Sign Code to maintain property values and to create a more aesthetically pleasing community, through the preservation of the natural beauty and environment of the City, by preventing the over concentration, improper balance, and density of signs, but keeping in mind the importance of signage to the business community, and the vital element it is to the free enterprise system (see Attachment "B").

History on Spectacular Signs

In 1998, Allen Theaters, Inc. submitted an appeal to overturn a staff interpretation regarding the use of a LED Information Board which was identified by Community Development staff as a *spectacular sign* (see Attachment "C"). At the time the Las Cruces Sign Code (Article XIII of the 1981 Las Cruces Zoning Code, as amended) prohibited *spectacular signs* which were defined as "any sign which oscillates, rotates, flashes, varies in intensity or in color, or automatically changes advertising, or is animated or equipped with a glaring or rotating strobe light, or with spotlights."

A public hearing was held by the Board of Adjustment on October 13, 1998; the Board of Adjustment upheld staff's interpretation and denied the appeal by Allen Theaters, Inc. On December 7, 1998, the Las Cruces City Council considered the appeal. Pursuant to Resolution 99-212 (see Attachment "C"), the Las Cruces City Council granted the appeal by Allen Theaters, Inc. and reversed the denial decision by the Board of Adjustment. Consequently, the automated, automatically changing advertising LED Information Board was not deemed a spectacular sign, and therefore, not prohibited in the Sign Code. Through this action, all signs having characteristics as stipulated in the spectacular sign definition were now considered permissible signs. It is important to note that the interpretation was reversed and not merely a dimensional requirement drawn into question.

History on Billboards

Based on the action by the Las Cruces City Council in December, 1998, as well as a review of the Sign Code, City staff proceeded to amend the Sign Code in 2006. On February 6, 2006, a sign code amendment that prohibited any new billboards was

~~brought before City Council. The City Council opted not to move forward with the~~ proposed amendment and directed staff to modify the sign code amendment as to improve the regulation of billboards rather than to simply ban them.

As part of the 2006 amendment, the billboard regulations included modifications to legal-nonconforming, modifications to what zoning districts billboards can be placed in (C-2, C-3, M-1/M-2, and M-3 only), modifications to what roadways billboards may be placed, and the incorporation of maximum setback requirements. This amendment was ultimately approved.

Previous sign code language stated that billboards could be placed on major arterials. In regards to the location and placement of billboards, the new regulations state:

> *Billboards may be located only along the following roadways and only along street segments having a minimum of 75 percent office, commercial, or industrial zoning. A street segment is defined as that length of a roadway located between intersections of two collector or higher classified roadways.*
>
> *Interstate 10* — *Interstate 25*
> *Bataan Memorial East & West (west of Porter Drive)*
> *Main Street* — *Picacho Avenue*
> *Amador Avenue* — *Lohman Avenue (west of I-25)*
> *Solano Drive* — *El Paseo Road*
> *Valley Drive* — *Motel Blvd (south of Picacho)*
> *Telshor Blvd (north of Lohman)*

For a complete review of the existing regulations as it pertains to billboards, please see Section 36-83 in Attachment "B."

Lighting

The Sign Code also presently addresses the use of lighting as it pertains to signs. Specifically, Section 36-12 states:

> Light from any source intended to illuminate a sign shall be shaded, shielded, or directed in such a way so that the light intensity or brightness shall not adversely affect the safe vision of pedestrian or vehicle operators on public or private streets, driveways, or parking areas, and shall not adversely affect any of the surrounding premises. Illumination from any sign shall not interfere with the effectiveness of any official traffic sign, signal or device.

Digital Signs – Federal and State of New Mexico Regulations

Federal Regulations

The Federal Highway Beautification Act of 1965 (HBA) contains language that regulates the use of outdoor advertising along both the interstate highway systems and existing Federal-aid primary roadway systems. The HBA also requires a Federal/State Agreement (FSA) with each State that includes language pertaining to an outdoor advertising control program.

In 2007, the USDOT Federal Highway System released a memorandum that provides guidance about off-premise changeable message signs or Commercial Electronic Variable Message Signs (CEVMS) adjacent to routes under the control of the HBA (see Attachment "E-2"). In summary, changeable message signs, including digital/LED display signs are acceptable forms of advertising provided that they are consistent with FSAs and with acceptable and approved State regulations, policies, and procedures. States may adopt more restrictive requirements than those found within the HBA, other Federal regulations, and existing FSAs.

If States do allow for the use of digital signs, the federal government provides minimum standards for the erection of digital signs, which include:

- Duration of Message: Duration of each display is generally between 4 and 10 seconds – 8 seconds is recommended.
- Transition Time: Transition between messages is generally between 1 and 4 seconds – 1 to 2 seconds is recommended.
- Brightness: Adjust brightness in response to changes in light levels so that the signs are not unreasonably bright for the safety of the motoring public.
- Spacing: Spacing between such signs not less than minimum spacing requirements for signs under the FSA, or greater if determined appropriate to ensure the safety of the motoring public.
- Locations: Locations where allowed for signs under the FSA except such locations where determined inappropriate to ensure safety of the motoring public.

State of New Mexico Regulations

New Mexico State Statute states that it is the public policy of the State to regulate the erection and maintenance of outdoor advertising in accordance with the Highway Beautification Act (see Attachment "F"). The New Mexico State Highway and Transportation Department also has outdoor advertising requirements (see Attachment "G"). Per 18.21.5.10 NMAC, no sign may be erected or maintained which:

1. Contains, includes, or is illuminated by any flashing, intermittent or moving light or lights;

2. Is lighted in any way unless the lighting is so effectively shielded as to prevent beams or rays of light from being directed at any portion of the main-traveled way of the interstate or primary systems, or is of such low intensity or brilliance as not to cause glare or to impair the vision of the driver of any motor vehicle, or to otherwise interfere with any driver's operation of a motor vehicle; or
3. Moves or has any animated or moving parts.

Per 18.21.5.21 NMAC, "signs shall not be placed with illumination that interferes with the effectiveness of any official traffic sign or device. Signs shall not include or be illuminated by flashing, intermittent or moving lights (except that part necessary to give public service information such as time, date, temperature, weather or similar information). No sign shall cause beams or rays of light of such intensity or brilliance to be mistaken for a warning or danger signal as to cause glare or impair the vision of any driver's operation of a motor vehicle."

The State's outdoor advertising requirements also make reference to a locality's zoning authority. Specifically, 18.21.5.28 states:

> Local political subdivisions shall have authority under their own zoning laws to zone areas for commercial or industrial purposes, and the bona fide action of such local political subdivision in this regard will be accepted for the purposes of these regulations. The Department will not issue permits for the erection of the new signs in areas where counties and municipal zoning ordinances are in effect and which require a permit to be issued for such signs by the county or municipal zoning authority...

Digital Signs – Regulatory Options

In early May 2010, the Community Development hosted a webinar sponsored by Lorman Teleconferences entitled "Current Issues in Digital Billboards and Sign Regulations" (see Attachment "H"). For local jurisdictions to consider the regulation of the use of digital signs there are eleven key regulatory issues that must be considered. These key regulatory issues include:

- The appropriate duration of dynamic messages;
- Whether, and under what conditions, to permit motion, animation, and video messages;
- The appropriate level of brightness of dynamic signs;
- The appropriate placement and spacing of signs;
- Whether to treat on-site and off-site dynamic signs differently;
- The appropriate size of dynamic signs;
- The appropriate text size for dynamic signs;
- The interval between successive displays;
- Visual effects between successive displays;

- ~~Message sequencing; and~~
- Amount of information displayed.

The webinar identified two reports in evaluating the abovementioned regulatory issues: (1) "Safety Impacts of the Emerging Digital Display Technology for Outdoor Advertising Signs" by Jerry Wachtel (April, 2009) (see Attachment "I") and (2) SRF Report for the City of Minnetonka "In connection with litigation regarding dynamic signs in the City of Minnetonka" (see Attachment "J"). From these two reports, suggested regulatory goals and options were identified for local jurisdictions seeking to regulate digital signs. These are summarized as follows:

- Minimize driver distraction associated with watching dynamic signs change by the setting the duration of sign messages to minimize the chance that motorists will see more than two successive messages...establish a minimum longitudinal distance between billboards;
- Make the interval between successive displays as close to zero as possible...;
- Reduce driver distraction by insuring that signs are conspicuous and legible;
- Minimize driver distraction by prohibiting video, tri-vision, scrolling text, flashing signs, or any other type of motion in dynamic signs or restricting motion to signs located in certain driving environments;
- Set a maximum motion time frame based on the length of time a sign is visible for a particular driver's speed, speed limits, and traffic volume;
- Limit or prohibit dynamic signs at intersections, in demanding driving environments, and in places where they obstruct a driver's view;
- Limit or prohibit dynamic signs that resemble traffic control devices;
- There is no standard approach to regulating the size of signs (most common size for billboards is 14 x 48 feet in horizontal format); and
- To increase legibility, reduce the time needed to read billboards, and reduce driver distraction, recommendation is that sign text be 1 inch high to be readable from 30-feet away or calibrate the appropriate text sized based on distance.

Regulatory Options for Brightness and Illumination

The webinar emphasized the April 2009 Wachtel report as the report provides detailed recommendations regarding the measurement of luminance, how those methods can be adopted for use by an jurisdiction, and how to measure luminance (see pages 151 to 158 of Attachment "I").

The Outdoor Advertising Agency of America (OAAA) hosted a webinar in July, 2008 on digital lighting (see attached PowerPoint presentation as Attachment "K"). The

PowerPoint presentation highlights the OAAA recommendations to measure luminance. These recommendations are also highlighted in the abovementioned April 2009 Wachtel report.

Position Statements Against Digital Billboards

Scenic America has released numerous papers on why digital billboards are unsafe and unsightly. Staff has included these papers and they are noted as Attachments L1-L4.

Additional Resources

The Planning Advisory Services (PAS) of the American Planning Association released an information packet in October 2008 on "Regulating Electronic and Moving-Image Signs" (see Attachment "M") Included in the comprehensive PAS packet, are eight reports on the pros and cons of digital signs. In addition, the PAS packet includes ordinances from various counties, municipalities with a population of 100,000 or greater, municipalities with a population between 25,000 and 100,000, and municipalities with a population less than 25,000.

City staff also consulted the sign regulations with the City of Albuquerque and City of Green Bay (see Attachment "N-1 and N-2).

All of these ordinances are included for your review and some of these ordinances were reviewed by Community Development staff with the preparation of the draft language to the Las Cruces Sign Code.

Draft Regulatory Language for City of Las Cruces Sign Code

In early 2009, Community Development staff began the process of amending the Sign Code to address existing problems as well as update the Code to better govern the changes in the sign industry. Staff included draft language that would regulate the use of digital signs and not prohibit digital signs. As part of this packet of material, staff included the draft language for Section 36-8 Nonconforming Signs, Section 36-41 On-premise signs, and Section 36-83 Billboards (see Attachment "O").

Conclusion

As the existing Las Cruces Sign Code contains no regulatory language on the use of digital signs and the use of digital signs is becoming more prevalent within the sign industry, it is the recommendation of Community Development staff that the Las Cruces City Council enact regulatory measures on the use of digital signs within Las Cruces.

ATTACHMENTS

"A".....1999 Comprehensive Plan – Urban Design Element
"B".....LCMC Chapter 36 – Sign Code
"C".....Resolution 99-212 – Spectacular Sign Appeal
"D".....Ordinance No. 2306 - 2006 Sign Code Amendment
"E-1".....USDOT FHWA 7/17/1996 Memo
"E-2".....USDOT FHWA 9/25/2007 Memo
"F".....67-12-1-15 NMSA 1978
"G".....NMDOT Outdoor Advertising Requirements
"H".....Webinar: "Current Issues in Digital Billboards"
"I".....April 2009 Wachtel Report
"J".....City of Minnetonka Report
"K".....OAAA Digital Light PowerPoint Presentation
"L1-L4".....Scenic America Position Statements
"M".....PAS Report October 2008
"N".....City of Albuquerque/City of Green Bay Ordinances
"O".....Draft CLC Sign Code Regulations

ATTACHMENT “A”

1999 Comprehensive Plan – Urban Design Element

URBAN DESIGN ELEMENT

Approved by City Council on May 4, 1999
Resolution No. 98-341

INTRODUCTION

Purpose of the Urban Design Element:

The Urban Design Element is a guide to the physical development of the City in terms of preservation, growth, and change, as well as aesthetic qualities. Urban design issues are much more difficult to quantify than other physical elements, such as the placement of land uses. Urban design issues, however, are no less important than other elements. In many ways such issues may transcend other physical elements as they influence the perceived image of the City.

The 1968 Comprehensive Plan did not address urban design issues. The 1985 Comprehensive Plan, however, did include an Urban Design Element. The Urban Design Element in the 1985 Comprehensive Plan focused on a myriad of topics, such as open space, view protection, architecture, and landscaping. While a landscaping requirement for commercial business, which was discussed in the Urban Design Element, was incorporated into the City's Design Standards, little else was accomplished due to the lack of clear goals and policies.

With each new generation of City growth, new generations of planning issues are created. Because people are more mobile in today's society, they have more opportunities to select where they live, work, shop and spend leisure time. The physical appearance of a community and its convenience weigh heavily on this decision. As a result, good urban design plays an important part in the economic well-being of a community. Thus, planning issues of great concern thirty years ago have branched out to include urban design issues today.

Current Issues

The City is concerned with preserving its natural environment. Las Cruces is located in a setting of striking environmental contrasts and scenic features. To the west is the Rio Grande and the lush agriculture of the Mesilla Valley. The limits of irrigation in the valley form stark lines of demarcation between a moist green landscape and the arid Chihuahua desert of the mesas. The Organ Mountains to the east, as well as distant mountains and peaks in nearly all directions, provide excellent views for City residents. This unique landscape should be emphasized and protected.

Urban Design extends into all elements of planning, such as, land use, transportation, housing, economic development, utilities, and the environment. Addressing urban design issues is especially critical to Las Cruces due to its mixed land use policies. The City's mixed use policy endeavors to establish and integrate a mix and/or variety of land uses within the City. This policy will help avoid a completely suburban character as well as provide convenience throughout the community. In doing so, however, uses which are not traditionally considered compatible may be located next to one another. Those uses with lower land use intensities

change over time; this defines the concept of a city's comprehensive plan as a "living document".

Image

There are several qualities a community may or may not possess which can leave a lasting impression on a first time visitor. These qualities include, but are not necessarily limited to, cleanliness, an orderly appearance, diversity, aesthetics, and the community's overall setting. This section of the Urban Design Element is meant to support a positive image of our City as a whole; not only for the visitor or newcomer, but long-time residents as well.

GOAL 1: Foster a unique and attractive character for Las Cruces to support an image which is distinct from surrounding communities.

Objective 1: Establish policies which will support an orderly and efficient community.

Policies:

1.1 Major and minor entrances (gateways) to the City should be emphasized to relay a sense of arrival to those traveling to and through Las Cruces.

a. Gateways should include:
- Avenida de Mesilla
- Interstate 10
- Interstate 25
- Lohman/Amador
- Picacho Avenue (west of City Limits)
- South Main to I-10
- University Avenue
- U.S. 70/North Main

b. Major corridors should include:
- El Paseo Road
- Missouri Avenue
- Picacho Avenue (City Limits to Main St.)
- Solano Drive
- Telshor
- Valley Drive

c. Emphasis should be placed on a theme for each gateway area. Elements of the streetscape in gateways and corridors should include, but not be limited to:

Objective 2: Establish high maintenance standards for public and private properties as the City's appearance relates directly to its image.

Policies:

2.1 An improvement of the City's visual quality should be attempted by reducing wind-blown trash/debris, dust, and vandalism.

a. A schedule should be developed to clean up those vacant properties which are owned by the City. Non-City owned public properties in the need of being cleaned-up should be brought to the attention of the appropriate City officials for immediate action.

b. Enhance existing programs and investigate other opportunities to deal with the clean-up and/or repair to properties affected by vandalism.

c. Appropriate City Codes should be amended to significantly reduce the permitted time between initial site preparation (clearance and/or grading) and commencement of construction in order to avoid problems with wind-blown dust and debris.

d. Encourage the surfacing of existing, unpaved roadways as a means of preventing dust-related problems.

2.2 Encourage the improvement and maintenance of existing commercial buildings as well as existing residential homes.

a. Workshops and design studios that would address new construction, renovation, and any other exterior modification should be offered in order to assist local merchants to create compatible and unique commercial projects. Additional programs, such as the possibility of beautification awards for commercial businesses as a way to promote community pride, should also be investigated.

b. Assistance for residences may be accomplished via awards, loans, grants, and/or a tool loan program.

c. The City should establish streamlined procedures for the demolition of structures which cannot be repaired/rehabilitated thus eliminating unsightly properties which pose safety concerns.

d. Promote unified street tree planting along street frontages to provide shade and visual relief, such as placing street trees along arterials and major collectors as a means of providing shade and enhancing Las Cruces' streetscape. Such trees should be of a drought tolerant variety and of a variety that does not create damage to sidewalk and curbing.

e. Projects which are surrounded with walls should be required to provide for an attractive streetscape.

1. Walls should vary in plane and texture.

2. Landscaping techniques, trees and climbing vines for example, should be employed along the periphery of the walled area for visual relief.

3. Encourage public art in new development and as an addition to existing developments.

f. Encourage the decoration of water towers and other similar utility structures based on historical and cultural aspects of Las Cruces.

4.2 Encourage shared driving aisles and shared parking areas to lessen visual clutter and promote greater traffic circulation efficiency.

4.3 Emphasize low maintenance landscaping and tree plantings for median development, along sidewalks, bicycle routes, and other types of rights-of-way.

4.4 Trees should be planted within all parking areas for visual relief as well as to provide shade relief in large-scale commercial parking areas.

4.5 Encourage existing businesses within the City of Las Cruces to comply with the City's landscaping requirement to beautify individual parcels of land and to promote attractive streetscapes. Incentives may include waivers to the required number of parking stalls.

4.6 Site designs that respect adjacent land uses as well as designated gateways and corridors using mitigation techniques found in Matrices 1 and 2 should be employed.

4.7 The City should establish minimum building construction standards as a means of promoting an aesthetically pleasing environment which supports the design characteristics established for adjacent neighborhoods and which will assist in maintaining an area's appeal.

5.5 Work with the Bureau of Land Management to continue to preserve the designated buffer around the Organ Mountains. The development of park space as a natural buffer between the urban area and the Organ Mountains should be encouraged.

5.6 Hillside development along Picacho Peak, Tortugas Mountain, and the other desert mountains which surround our community should be discouraged.

5.7 Easements along or ownership of major arroyos for drainage, open space networks and alternate transportation modes should be acquired.

a. Develop arroyos, rights-of-way and City-owned land as multi-use open spaces, stressing the development of recreational trails and other connections between parks and other public and private open spaces, maintenance of natural landscape and aesthetic drainage improvements.

b. The City should work with the Bureau of Land Management, the State of New Mexico, and private developers to preserve arroyos on the east and west mesas as open space.

5.8 Views and vistas should be protected for the community as a whole through reasonable limitations to building heights.

a. Preserve the unobstructed views of the desert mountains so that they may be seen from many directions in and around Las Cruces.

b. Preserve the unobstructed views of the River Valley from various points along the Mesas.

c. Preserve the vistas which overlook our community.

Objective 6: Encourage the preservation and/or renovation of historical buildings and places in Las Cruces.

Policies:

6.1 Seek a local historic district designation to enhance national and state historic districts and create an Historic Preservation Board who will deal with those issues pertaining to designated historic districts.

6.2 Neighborhood/district overlay zones should be created for those areas that come under an historic district designation to establish specific guidelines concerning new

8.2 Utilities and all other types of infrastructure should comply with City's Growth Management Polices found in the Land Use Element, Capital Improvement Programs and/or as outlined within approved Master Plans.

Design

Design includes those aesthetic and environmental issues which the City of Las Cruces would like to address. Emphasis is placed on compatibility, visual harmony as well as function in and between existing and new development, especially at the neighborhood and district level.

GOAL 3: Maintain sensitivity to the City's image through the careful application of aesthetic and environmental guidelines of its neighborhoods and districts.

Objective 9: Enhance our community's natural environment, physical environment, and character through quality design.

Policies:

9.1 Residential and Commercial development should preserve a regional Desert Southwestern image rooted in a variety of architectural styles and design elements and strengthened by creative contemporary expression.

9.2 Encourage the use of landscape materials best suited to our location in the Chihuahuan Desert. Developments located in mesa areas, such as the East Mesa, High Range, and Las Alturas, are encouraged to use desert landscape materials. Developments located toward the Rio Grande Valley should be encouraged to use those plant materials best suited for the Valley environment. Developments located in the urban area are encouraged to use drought tolerant landscape materials that are compatible with the landscaping styles of the surrounding area.

a. Through educational efforts, promote the City's Water Conservation Ordinance and the concept of xeriscaping.

b. The City should investigate the possibility of designating geographic landscaping areas (pursuant to this policy) throughout Las Cruces as a means of furthering support for efficient, water-saving landscaping techniques and themes.

1. Landscaped development signs or focus points at the entry of each development.

2. Textured paving at the entry to or at crossroads throughout the neighborhood.

3. Unified architecture (especially where a theme has been adopted) that provides a myriad of styles, massing, roofs, facades, setbacks, and materials.

4. Unified landscaping along right-of-ways.

5. Non-glaring, unified/decorative lighting.

Objective 10: Instill compatibility, function and practicality in and between new and existing development by establishing development guidelines to ensure quality site design.

Policies:

10.1 Infill development, both new development and redevelopment, should be required to respect the architectural styles, bulk, setbacks, color, scale, character and site design relationships of the existing neighborhood.

10.2 Support those residential developments which possess an identifiable neighborhood image while still providing a variety of housing styles in order to avoid a monotonous, "cookie-cutter" appearance.

a. Developers should provide a variation of residential facades to provide visual interest.

b. Encourage a variety in setbacks and structure spacing as a means of avoiding monotony and uniformity.

10.3 Encourage site built, mobile homes (parks, subdivisions, or otherwise), manufactured, modular, and paneled homes to be architecturally consistent with adjacent residential uses.

10.4 Encourage developers of commercial and industrial areas to respect the architectural styles found in adjacent areas.

pedestrian scale facades on all sides of the building (windows, doors, landscaping, and fine grain detail in materials).

(d) Screen stacking lanes/drive-up aisles from view with landscaping or placing such lanes where they are not readily seen from streets and sidewalks.

c. Mitigation techniques and landscaping and distance requirements should be followed when a business registration, zone change, or new construction creates adjacent land uses which differ from one another. The use which is creating the change should mitigate any possible problems between other land uses using the techniques listed below.

d. Specific landscaping regulations will be found in lower level planning documents.

Mitigation Techniques

Concept:

Las Cruces currently encourages mixed-land uses in order to decrease the need for extended trips for work and/or shopping. Due to a mixed land use policy, however, some land uses which are not traditionally considered compatible may be located next to one another. Those uses with lower intensities must be protected from adjacent uses with higher intensities in order to protect a desirable quality of life within the City. Protection comes in the form of buffering and screening, site design, architectural controls, transportation networks, concentration of uses, and the ratio of uses. New development, redevelopment, and/or special uses may be required to comply with various techniques as deemed necessary by staff and/or the Planning and Zoning Commission.

Buffering/Screening:

There are two means of buffering and/or screening: natural and man-made. Natural buffering/screening softens the visual effects of mixed uses adjacent or in close proximity to one another. For instance, landscaping covering a view-screening wall or fence, blank-wall, or dumpster will soften the impact of that structure on the surrounding area. Trees and/or a berm along a street frontage will soften the visual effect of a parking lot. Landscaping may be opaque, semi-opaque, and broken screen. (See Las Cruces Design Standards and Matrix 1 for definitions as well as how and when these variations are to be used). Open space, a greenbelt or arroyos, for instance, works as natural barriers between adjacent areas and acts as a physical barrier to break-up and shield differing uses.

Man-made buffering/screening consists of barriers such as wall/fences, roads, and railroad lines which physically separate varying uses from one another. Physical barriers/separations lend a feeling that differing uses are segregated rather than clashing with one another.

Site Design:

How one arranges a site may also ease the differences between varying uses. Structures with a large front yard setback will have limited visibility from the street, thereby blending into the surrounding neighborhood. Parking areas, when positioned away from adjacent structures will also ease the differences between uses. Keeping parking areas away from residential uses, for example, will mitigate problems with noise, fumes, and aesthetics. Confining such accessory uses as dumpsters away from adjacent structures, especially residential uses, will also mitigate any problems with noise, odor, and aesthetics. The orientation of commercial and industrial uses is an important factor in site design. For example, windows should face away from residential uses and blank walls should be covered with landscaping in order to protect views from adjacent residential areas. Lighting and signage for commercial and industrial uses,

Matrix 1: Separation and Landscaping Requirements between Land Uses/Zones

Listed here are separation and landscaping requirements that all forms of development are encouraged to follow when a proposed use is locating next to differing adjacent land uses/zones. Such landscaping and buffering requirements are only one tool used to mitigate the impacts to adjacent land uses/zones.

Adjacent Use

Proposed Use	RA, UR, EE VLD Res.	R-1M, R-1a,b &c LD Res.	R-2 MD Res.	R-3, R-4 HD Res.	O-1 Neigh. Office	O-1 Pro. Office	C-1 Low Inten. Comm.	C-2 Med. Inten. Comm.	C-2 High Inten. Comm.	C-2 Reg. Comm.	M-1 L. Indust.	M-1 S. Indust.	M-2 H. Indust.
VLD Res. RA, UR, EE	R	R	R	R	R	SB 30'	SB 35'	SB 40'	SB 75'	SB 75'	SB 75'	SB 175'	SB 225'
LD Res. R-1M, R-1a,b &c	R	R	R	R	R	SB 30'	SB 35'	SB 40'	SB 50'	SB 50'	SB 50'	SB 150'	SB 215'
MD Res. R-2	BY 10' B	BY 10' B	R	R	R	R	R	SB 35'	SB 45'	SB 45'	SB 45'	SB 115'	SB 215'
HD Res. R-3, R-4	BY 10' B	BY 10' B	BY 5' B	R	R	R	R	R	R	SB 30' B	SB 40' B	SB 115' C	SB 215' C
Neigh. Office O-1	BY 10' B	BY 10' B	BY 10' B	R	R	R	R	R	R	R	R	R	R
Pro. Office O-1	BY 10' B	BY 10' B	BY 10' B	R	R	R	R	R	R	R	R	R	R
Low Inten. Comm. C-1	BY 10' B	BY 10' B	BY 10' B	BY 5' B	R	R	R	R	R	R	R	R	R
Med. Inten. Comm. C-2	BY 25' B	BY 25' B	BY 10' B	BY 10' B	BY 10' B	R	R	R	R	R	R	R	R
High Inten. Comm. C-2	BY 50' B	BY 50' B	BY 15' B	BY 15' B	BY 15' B	R	R	R	R	R	R	R	R
Reg. Comm. C-2	BY 50' B	BY 50' B	BY 15' B	BY 15' B	BY 15' B	BY 10' B	R	R	R	R	R	R	R
L. Indust. M-1	BY 50' B	BY 50' B	BY 25' B	BY 25' B	BY 20' B	BY 20' B	BY 20' B	R	R	R	R	R	R
S. Indust. M-1	BY 150' C	BY 150' C	BY 100' C	BY 100' C	BY 100' C	BY 100' C	BY 100' C	BY 60' C	R	R	R	R	R
H. Indust. M-2	BY 200' C	BY 200' C	BY 200' C	BY 200' C	BY 150' C	BY 150' C	BY 150' C	BY 125' C	R	R	R	R	R

Key:

1) The first letter denotes a total setback or buffer that is required for that particular zone/land use.
   - SB = Setback
   - BY = Bufferyard
   - R = Regular setback required for that zoning district

2) The second letter denotes the type of landscaping required for that particular zone/land use.
   - A = Opaque screen
   - B = Semi-opaque screen
   - C = Broken screen

For example:

BY 150' C

Type of separation — Distance requirement — Type of landscaping

3) Types of land uses:
   - VLD Res. = Very Low Density
   - LD Res. = Low Density
   - MD Res. = Medium Density
   - HD Res. = High Density
   - Neigh. Office = Neighborhood Office
   - Pro. Off. = Professional Office
   - Low Inten. Comm. = Low Intensity Commercial
   - Med. Inten. Comm = Medium Intensity Commercial
   - High Inten. Comm. = High Intensity Commercial
   - Reg. Comm. = Regional Commercial
   - L. Indust. = Light Industrial
   - S. Indust. = Standard Industrial
   - H. Indust. = Heavy Industrial

Note:
1) The setback number represents the total setback required and applies to all property lines that abut the defined adjacent land uses/zones.
2) The setback denoted in this matrix is required only when the adjacent property to a proposed use is vacant.
3) Bufferyards are required regardless if the adjacent property is vacent or developed.
4) Permitted uses in buffer areas include open space and drainage uses. Structures are prohibited in these areas.
5) Reduction in bufferyards may be considered when opaque screening is used.
6) Zoning designations are subject to change.
7) The Planning Director or his/her designee shall determine use intensity when required.

ATTACHMENT "B"

LCMC Chapter 36 – Sign Code

CITY OF LAS CRUCES

SIGN CODE

LCMC Chapter 36

Amended: April 26, 2010

Printed: May 2010

Chapter 36
SIGNS*

* **Cross References:** Advertising, Ch. 3; Merchandising, Advertising and Signs in Parks, § 20-37; Streets and Sidewalks, Ch. 26; Buildings and Building Regulations, Ch. 30; Development Impact Fee, Ch. 33; subdivisions, Ch. 37; Zoning, Ch. 38.

Article I. In General

Sec. 36-1. Purpose.	**Art 1 - 1**
Sec. 36-2. Scope.	**Art 1 - 1**
Sec. 36-3. Definitions.	**Art 1 - 1**
Sec. 36-4. Calculation of sign area.	**Art 1 - 7**
Sec. 36-5. Variances.	**Art 1 - 7**
Sec. 36-6. Structural requirements.	**Art 1 - 7**
Sec. 36-7. Maintenance and removal.	**Art 1 - 8**
Sec. 36-8. Nonconforming signs.	**Art 1 - 9**
Sec. 36-9. Permits.	**Art 1 - 10**
Sec. 36-10. Prohibited signs.	**Art 1 - 12**
Sec. 36-11. Placement.	**Art 1 - 13**
Sec. 36-12. Lighting.	**Art 1 - 14**
Sec. 36-13. Enforcement.	**Art 1 - 15**
Secs. 36-14--36-40. Reserved.	

Article II. On-Premises Signs

Sec. 36-41. General conditions.	**Art 2 - 1**
Sec. 36-42. Single Family Residential zones REM, RE, EE, R-1aM, R-1bM, R-1cM, R-1a, R-1b, R-1c.	**Art 2 - 4**
Sec. 36-43. Multi-family Residential zones R-2, R-3, R-4.	**Art 2 - 4**
Sec. 36-44. Flood Control zones FC.	**Art 2 - 4**
Sec. 36-45. Office, neighborhood commercial zones O-1, O-2, C-1.	**Art 2 - 4**
Sec. 36-46. Commercial and Industrial zones C-2, C-3, MTech, M-1M-2, M-3.	**Art 2 - 6**
Sec. 36-47. Business centers (various zones).	**Art 2 - 7**
Sec. 36-48. Sign regulations in overlay zone districts.	**Art 2 – 7**
Sec. 36-49. Planned Unit Development zones PUD	**Art 2 - 7**
Secs. 36-50---36-80. Reserved.	

Article III. Off-Premises Signs

Sec. 36-81. Attached signs.	**Art 3 - 1**
Sec. 36-82. Public area signs.	**Art 3 - 1**
Sec. 36-83. Billboards.	**Art 3 - 2**
Sec. 36-84. Garage, private sale or event signs.	**Art 3 - 3**
Sec. 36-85. Government signs.	**Art 3 - 3**
Sec. 36-86. Political signs.	**Art 3 - 3**
Sec. 36-87. Vehicle signs.	**Art 3 - 4**
Sec. 36-88. Athletic field signs.	**Art 3 - 4**
Sec. 36-89. Neighborhood signs.	**Art 3 - 4**
Secs. 36-90--36-115. Reserved.	

Article IV. Temporary Signs

Sec. 36-116. Construction/renovation signs.	**Art 4 - 1**
Sec. 36-117. Real estate signs.	**Art 4 - 1**
Sec. 36-118. Commercial promotional displays.	**Art 4 - 3**
Sec. 36-119. Residential promotional displays.	**Art 4 – 3**

Appendix 1. Development Standards

Appendix 2. Examples and Illustrations

ARTICLE I.
IN GENERAL

Sec. 36-1. Purpose.

The purpose of this chapter is to permit signs that will not, by their size, location, or construction, endanger the public health and safety of individuals or confuse, mislead, or obstruct the vision necessary for traffic safety. Furthermore, it is the purpose of this chapter to maintain property values and to create a more aesthetically pleasing community, through the preservation of the natural beauty and environment of the city, by preventing the over concentration, improper placement, and density of signs, but keeping in mind the importance of signage to the business community, and the vital element it is to the free enterprise system.

(Ord. No. 1128, § A.1, 5-18-90)

Sec. 36-2. Scope.

This chapter shall apply to all signs, as that term is defined in section 36-3, within the city limits.

(Ord. No. 1128, § A.2, 5-18-90)

Sec. 36-3. Definitions.

The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning (See Appendix 2 for examples and illustrations).

Abandoned sign means an on- or off-premises sign that no longer directs, promotes, or advertises a bona fide business, lessee, owner, product, or activity conducted or product or service available on the premises where such sign is displayed.

Accessory use sign means any sign that is printed on or included in the design of any object which cannot be construed as being a building or freestanding sign (i.e. vending machines, menu signs, ATM machines, etc.).

Advertising means the action of calling something to the attention of the public by verbal or visual presentation.

Athletic field means a wide stretch of open land used for outdoor games such as baseball, football and soccer.

Attached sign means any sign which is fastened to, connected to, or painted on and wholly or partially supported by a building.

Awning means a hood or cover which projects from the wall of a building and is composed of rigid or nonrigid materials.

Awning sign means a sign which is fastened to or painted on an awning.

Banner means a sign composed of lightweight, flexible material on which letters, symbols or pictures are painted or printed.

Bench sign means any sign affixed to or painted on a functional bench.

Billboard means an off-premises sign directing attention to a business, activity, commodity, service, entertainment, or communication, none of which may be conducted, sold or offered on the premises where the billboard is located.

Bonus means an allowance for additional sign area as an incentive to reduce the legal height permitted, or to remove nonconforming signs.

Business/service center means a group of two or more businesses planned, constructed, owned and managed independently or as a total entity which share access, parking, or landscaping.

Canopy or marquee means a permanent roof-like shelter extending from part or all of a building or independent of a building.

Canopy sign means a sign attached to or painted on a canopy.

Clear sight triangle means a triangular area of unobstructed vision at street intersections and at entrances/exits, permitting a vehicle driver to see approaching vehicles to the right or left. Refer to Article VI, Division 3 of the City of Las Cruces Design Standards.

Codes means any other applicable city, state or federal codes.

Collector street means a street which collects traffic from local streets and connects with major and minor arterials.

Construction/renovation sign means any temporary sign erected on the premises where construction/renovation is taking place and indicating the names of the architects, engineers, landscape architects, financial institutions, contractors or similar artisans, and the owners, sponsors, and similar individuals or firms having a role or interest with respect to the structure or project.

Copy means the verbal, visual or pictorial portion of any sign.

Corporate pertains to any organization incorporated pursuant to law.

Decorations means any display which calls attention to a community-organized event or to a state or national holiday.

Development identification sign means a permanent sign installed or constructed at the entrance/exit to a residential or commercial development to identify the development name and logo only.

Directional sign means any sign erected for the convenience of the public, such as the directing traffic movement, parking or identifying restrooms, public telephones, walkways and other similar features or facilities, and bearing no advertising message, excluding those erected by the United States Department of Transportation and the state highway and transportation department.

Flag/decorative means any rectangular display constructed of lightweight material having no logo or advertising message printed or painted on it.

Freestanding sign means any sign attached to or supported from the ground, and not attached to a building.

Garage sale sign. See *Private sale or event sign.*

Gate entrance sign means any sign installed or constructed over the entrance to the premises in specific zoning districts as described in this chapter.

Government sign means any sign erected by any city, county, state or federal agency or its designee, setting forth information pursuant to law.

Ground sign means any sign which is attached to either the ground or to a footing set flush with the ground.

House or building sign or nameplate means a sign limited to identifying the street name, building or property number, and the name of the owner or occupant of the building or property.

Illuminated sign means any sign which is lighted internally, externally or by lights directed towards the sign by any light source.

Information sign means any sign whose purpose is to indicate the business, hours of operation or similar identification information.

Legal notice means any sign required by law or pursuant to a court order.

Local street means a street designed to provide access to abutting property and local streets, and to discourage through traffic.

Logo means an identifying symbol used for advertising purposes.

Maintenance means the total upkeep of a sign, structurally and electrically, in terms of safety, and cosmetically, in terms of visual attractiveness.

Major arterial means a street with access control, channelized intersections, restrictive parking, and which distributes and collects traffic to and from minor arterials.

Marquee or canopy. See *Canopy.*

Marquee sign means a sign attached to, mounted on or painted on a marquee.

Minor arterial means a street with signals at important intersections and stop signs on side streets and which collects and distributes traffic to and from collector streets.

Model complex sign means any sign located on a complex site, limited in time until the complex ceases to be a model complex.

Mural means a picture or graphic illustration applied directly to a wall of a building or structure which does not advertise or promote a particular business, service or product.

National, state and corporate flags means any rectangular display constructed of lightweight material used to identify a nation, state or corporation.

Neighborhood Sign means a sign erected for the convenience of the public, directing traffic to and/or identifying specific neighborhoods and bearing no logo, tagline or advertising message,

Nonconforming sign means any sign legally erected and permitted in compliance with codes at the time it was erected and permitted, but which does not conform to current codes or this chapter.

Off-premises sign means a sign which advertises or directs attention to a business, product, service or activity which is not available on the premises where the sign is located.

On-premises sign means a sign which advertises or directs attention to a business, product, service or activity which is available on the premises where the sign is located.

Pennant means a display made of a lightweight material which tapers to a point, having no logo or advertising message printed on it.

Point-of-sale sign means any sign which is located or attached directly to the product to be sold.

Pole sign means any sign whose primary means of support is one or more poles set into a concrete footing, located at or below ground level.

Political sign means a sign pertaining to any national, state or local election and/or caucus.

Portable sign means a freestanding sign not permanently affixed, anchored or secured to the ground or a building, which may be rolled or moved about.

Private sale or event sign means a temporary sign advertising private sales of personal property at garage, yard or estate sales and the like; private fundraising events, such as a nonprofit carwash, or food/clothing drive, etc.

Product identification sign means any sign used to identify the supplier/contractor of the construction product being used.

Prohibited sign means any sign not expressly permitted within this chapter, or any sign which is specifically prohibited in this chapter, as provided in section 36-10.

Promotional display, commercial means special advertising for grand openings, anniversaries, special or seasonal events, and which are for a limited time, in addition to the legal signage permitted.

Promotional display, residential means special advertising using pennants, flags, streamers, banners, open house signs and other similar signs, the duration of an open house or similar showing.

Public area means any bus bench, bus shelter, landscaped median, trail, park, or arroyo duly recognized by the city.

Real estate broker identification sign means a sign used at a broker's residence for identification purposes as prescribed by state law.

Real estate directional sign means a sign which advertises or directs attention to real property not available on the premises where the sign is located.

Real estate sign means a sign intended to advertise the financing, development, sale, transfer, lease, exchange or rent of real property.

Roof sign means any sign which is attached to the roof of a building or structure.

Setback means the distance required from the property line or from other buildings/structures or businesses.

Shopping center means a group of commercial establishments planned, constructed and managed as a total entity with customer and employee parking provided

on site, provision for goods delivery separated from customer access, aesthetic considerations and protection from the elements.

Sign means any advertisement, announcement, direction or communication produced in whole or in part by the construction, erection, attachment or placing of a structure or object on any land, or on any other structure, or produced by painting on, posting or placing any printed, lettered, pictured, figured or colored material on any building, structure or surface.

Sign administrator means a city employee so designated to administer and enforce the terms and conditions of this chapter, the codes, and all other provisions of laws pertaining to signs.

Special use sign means any sign intended for use by establishments requiring a special use permit pursuant to chapter 38.

Streamers means a display made of light, flexible material, consisting of long, narrow, wavy strips having no logo or advertising message printed or painted on it.

Street Segment means the length of a roadway located between intersections of two collector or higher classified roadways based upon the Las Cruces Metropolitan Planning Organization designation.

Structural requirements means the safety standards that apply to those signs governed by the requirements in the Building Code and other companion documents.

Temperature/time/date sign means any sign with the purpose of displaying the temperature, time, date and logo/name.

Temporary sign means any sign intended for a limited period of display.

Total front footage means the total length of a property fronting on any side of a public street, or the total length of a building on which a sign is allowed.

Trademark/label/name means identification applied or attached to each permitted sign to designate the manufacturer and installer.

Unlawful sign means any sign ever erected which does not have a valid permit or, after erection, did not comply with all applicable provisions of the permit under which it was constructed and erected, or did not comply with all provisions of codes, or which does or did not meet the necessary requirements to be considered nonconforming.

Unlicensed commercial sign means any sign erected by an individual, group, organization or club for fundraising or other monetary gain.

Unsafe sign means any sign identified by the sign administrator as being improperly constructed and installed, erected or secured, thereby subject to falling or creating a safety hazard, with supported findings.

Variance means an authorization granted to a property owner to depart from the numerical requirements of the zoning regulations (as applied here, this chapter).

Vehicle sign means a sign painted on or attached to either a vehicle or to a trailer designed to be pulled behind a motorized vehicle, which relates to a business, activity, use, service or product.

Wall sign means any sign affixed flush to or painted upon the wall of any building.

Window sign means any sign that is applied or attached to the exterior or interior of a window or a window frame.

(Ord. No. 1128, § B, 5-18-90; Ord. No. 1292, 12-21-92; Ord. No. 1526, 4-1-96; Ord. No. 2111, §§ I, II, 6-21-04; Ord. No. 2141, § I, 10-4-04; Ord. No. 2304, 5-15-06; Ord. No. 2575, 4-26-10)
Cross References: Definitions generally, § 1-2.

Sec. 36-4. Calculation of sign area.

(a) The area of an attached sign is measured as the area within the smallest rectangle or combination of rectangles which contains all text, symbols or other graphic elements, plus any background area which does not appear as a continuous portion of the building surface that highlights a sign.

(b) The area of a freestanding sign is measured by determining the sign area of all sides that are visible from any one vantage point, except only one side of a sign shall be measured if the two sides are back to back or separated by an angle of 45 degrees or less. If the two sides are not of equal size, the larger side shall be measured.

(Ord. No. 1128, § I.1, 5-18-90; Ord. No. 1292, 12-21-92; Ord. No. 1297, 2-2-93)

Sec. 36-5. Variances.

(a) There shall be no flexible development standards issued for any section addressed in this chapter.

(b) Variance requests shall follow procedures and requirements outlined within Chapter 38.

(Ord. No. 1128, § I.2, 5-18-90)

Sec. 36-6. Structural requirements.

(a) All signs shall conform to the structural design requirements set forth in the International Building Code and companion documents.

(b) Sign permit applications for freestanding signs exceeding 20 feet in height, measured from ground level, shall be accompanied by an engineer's design drawing showing the appropriate calculations. The drawing shall be stamped by an engineer certified in the state.

(Ord. No. 1128, § I.3, 5-18-90; Ord. No. 2304, 5-15-06)

Sec. 36-7. Maintenance and removal.

(a) *Damaged signs.* When any sign is substantially damaged, destroyed, taken down or removed for any purpose other than copy change or normal maintenance operation, it shall not be re-erected, reconstructed or rebuilt except in full compliance with this chapter.

(b) *Unsafe signs.* If, in the opinion of the sign administrator, any sign becomes unsecured, unsafe or subject to fall, the sign administrator upon supported findings shall give written notice of the sign's condition to the person(s) responsible for the sign (the owner or lessee) and the land owner. The person so notified shall correct the unsafe condition of the sign within seven days in conformance with this chapter.

(c) *Maintenance.*

(1) All signs shall be kept in good repair, both structurally and in appearance. All braces, bolts, clips, fastenings and the supporting frame shall be securely affixed to the support structure or wall and shall be free from insect infestation, rot or other deterioration.

(2) If the message portion of a sign is not maintained or if it is removed, leaving only the supporting shell of a sign or the supporting braces, anchors or similar components, the owner of the sign or the owner of the property where the sign is located or other person having control over such sign shall, within 30 days of the removal of the message portion of the sign, either replace the entire message portion of the sign or remove the remaining components of the sign. This subsection shall not be construed to alter the prohibition on the replacement of a nonconforming sign, nor shall this subsection be construed to prevent the changing of the message of a sign.

(d) *Repair, alteration or removal.* Any written notice to repair, alter or to remove a sign will be sent via certified mail by the sign administrator to the land owner

and to the sign owner lessee, or person(s) responsible for the sign. If such order is not acted on within seven days, the sign administrator may initiate proceedings contained in this chapter to revoke the permit and remove the sign at the expense of the land owner, sign owner, lessee, or person(s) responsible for the sign.

(e) *Unlawful signs.* If any sign is installed, erected, constructed or maintained in violation of any of the terms of this chapter, or the applicable code the sign was erected under, the city may issue a written warning to the sign owner, lessee, property manager or landowner. This warning shall outline the violation and order the designated responsible party to bring the sign into compliance with this chapter and any other applicable codes within 14 days from the date of the warning. Only one warning per violation will be issued. The warning shall remain in effect for the duration of the business.

(Ord. No. 1128, § I.4, 5-18-90)

Sec. 36-8. Nonconforming signs.

(a) Subject to the remaining restrictions of this section, nonconforming signs that were otherwise lawful on the effective date of the ordinance from which this chapter derives may be continued.

(b) No person may engage in any activity that causes an increase in the extent of nonconformity of a nonconforming sign. Without limiting the generality of this statement, no nonconforming sign may be enlarged or altered in such a manner as to aggravate the nonconforming condition, nor may illumination be added to any nonconforming sign.

(c) Any change in the use of any building or property on which a nonconforming sign is located will require that all nonconforming signs on that property be brought into compliance with all applicable sections of this chapter within nine months of the change.

(d) A nonconforming billboard may be reconstructed on the same property so as to meet the size, height, configuration, **and** support requirements of this code without losing its legal nonconforming status. To the extent possible, setback and separation requirements will be met. A sign permit is required in order to rebuild a nonconforming sign under this provision.

(e) A nonconforming on premise sign may not be moved or replaced except to bring the sign into conformity with this chapter to the extent possible. For the purpose of this subsection, the term "replaced" means the replacing of any or all parts of a sign that would extend the normal life span of the sign. An example is replacing wood pole supports with metal I-beam supports.

(f) If a nonconforming sign is destroyed, damaged or in need of repair, it may not thereafter be repaired, reconstructed or replaced except in conformity with all the

sections of this chapter and the remnants of the former sign structure shall be cleared from the land. For purposes of this subsection, a nonconforming sign is destroyed, damaged or in need of repair if damaged up to 50 percent of the cost of repairing the sign to its former stature or if the cost of replacing it equals or exceeds the tax value (tax value if listed for tax purposes)/sign valuation (as stated on the original permit) of the sign so damaged, whichever is less.

(g) The message of a nonconforming sign may be changed so long as this does not create any new nonconforming issues (for example, by creating an off-premises sign under circumstances where such a sign would not be allowed).

(h) If a nonconforming sign other than a billboard advertises a business, service, commodity, accommodation, attraction or other enterprise or activity that is no longer operating or being offered or conducted, that sign shall be considered abandoned and shall be removed within 90 days after such abandonment by the sign owner, owner of the property where the sign is located or other party having control over such sign.

(i) If a nonconforming billboard remains blank for a continuous period of 90 days, that billboard shall be deemed abandoned and shall be altered to comply with this chapter or be removed by the sign owner, owner of the property where the sign is located or other person having control over such sign. For purposes of this subsection, a sign is blank if:

(1) It advertises a business, service, commodity, accommodation, attraction or other enterprise or activity that is no longer operating or being offered or conducted;

(2) The advertising message it displays becomes illegible in whole or substantial part; or

(3) The advertising copy has been removed.

(j) The city shall reserve the right to remove a nonconforming sign in accordance with state law.

(k) This section shall not apply to any benches placed under the terms of any contract in effect on the date effective date of the ordinance from which this chapter derives.

(Ord. No. 1128, § I.5, 5-18-90; Ord. No. 1507, 2-5-96; Ord. No. 2304, 5-15-06)

Sec. 36-9. Permits.

(a) Sign permits shall be required for all signs unless otherwise stated in this chapter.

(b) Signs not requiring permits under this chapter shall be as follows:

(1) Accessory use signs.

(2) Change of copy on legally established signs.

(3) Construction/renovation signs (those not exceeding 16 square feet in sign area).

(4) Decorations for national holidays or communitywide festivals and fiestas.

(5) Directional signs.

(6) Flags/decorations.

(7) Garage sale signs.

(8) Government signs.

(9) House or building signs or nameplates.

(10) Information signs.

(11) Legal notices.

(12) Model complex signs (those not exceeding 16 square feet in sign area).

(13) National, state and corporate flags following accepted flag protocol.

(14) Pennants.

(15) Point-of-sale signs.

(16) Political signs, except billboards.

(17) Private sale or event signs.

(18) Product identification signs.

(19) Promotional displays, residential.

(20) Railroad signs.

(21) Real estate broker identification signs.

(22) Real estate directional signs.

(23) Real estate signs (those not exceeding 16 square feet in sign area).

(24) Streamers.

(25) Vehicle signs.

(Ord. No. 1128, §§ G, I.6, 5-18-90)

Sec. 36-10. Prohibited signs.

(a) Any sign not expressly permitted within this chapter is prohibited.

(b) A sign placed or painted on any motor vehicle, recreational vehicle, trailer or other movable device that reasonably indicates the use of such vehicle, trailer or device as a sign is prohibited. This includes the parking of such vehicle, trailer or device in such a manner as to constitute a sign. This does not include vehicles, etc., used in the course of normal business activities.

(c) Any sign constructed to resemble any official marker or sign normally erected by a city, state or federal government agency or a sign using words, phrases, symbols or characters in such a manner as to interfere with, mislead or confuse traffic is prohibited.

(d) A sign advertising activities that are illegal according to federal or state laws, rules or regulations and county or city ordinances or resolutions is prohibited.

(e) Any sign erected on, attached to or painted on retaining walls, fences, rocks or natural features is prohibited. This prohibition shall not include development identification signs placed on walls used for landscaping purposes and athletic field signs as defined in section 36-88.

(f) Any sign illegally placed, constructed or maintained is prohibited.

(Ord. No. 1128, § H, 5-18-90; Ord. No. 1526, 4-1-96; Ord. No. 1854, § II, 2-5-01; Ord. No. 2304, 5-15-06; Ord. No. 2440, 3-24-08)

Sec. 36-11. Placement.

(a) No sign shall be permitted to violate the clear sight triangle as referenced in Article VI, Division 3 of the City of Las Cruces Design Standards.

(b) No sign shall obstruct any door, stairway, fire escape or opening intended to provide ingress and egress for any building or structure.

(c) Signs may not be located in a manner that obscures or interferes with the effectiveness of any official sign, signal or device. A sign shall not be placed at any location where it obstructs or interferes with the clear view of any traveler on any street.

(d) No sign shall be constructed within any public right-of-way or sidewalk nor shall any portion of any sign extend onto or over a public right-of-way or sidewalk unless a specific exception is provided for in this chapter.

(e) No permit for a sign that extends beyond private property onto a public street, public sidewalk or public alley will constitute a permanent easement. Every such permit shall be revocable by the sign administrator. The city shall not be liable for any damages to the owner because of such revocation.

(f) The city, civic groups and non-profit entities who desire to utilize the city utility poles for placement of banners or other signs or attachments may do so only for a large event, celebration or festival of city-wide interest or other community or county-wide attraction. Such events, celebrations, festival or attraction are those events, celebrations, festivals or attractions which are designed to attract large numbers of city residents and tourists, may occur on an annual or semi-annual basis and which promote the city's history, natural and cultural beauty, art, cuisine and/or athletic events (e.g. The Whole Enchilada Festival, Gus Macker Basketball Tournament, Border Book Festival, The Renaissance Fair, the Fourth of July).

(1) A special sign permit shall be obtained, indicating the dates of display, number of banners to be displayed, location(s) of display, etc. and must be approved by the city manager or designee.

(2) All banners shall be installed and removed either by the city or the entity requesting the display.

a. If installed and removed by the city, permit fees shall be based on the number of banners to be installed/removed at a rate approved by the city council (Resolution #00-360). Permit fees shall be paid by the applicant upon permit approval and in advance of sign installation.

b. If installed and removed by the entity requesting the display the city requires a minimum of $1,000,000.00 insurance, with the city being named as an additional insured party and the entity must provide a hold harmless indemnity agreement, not holding the city responsible for any accidents or loss in the installation/removal of the banners.

(3) Banners shall be restricted to placement on city-owned utility/light poles only.

(4) Banners shall only be displayed along major arterials, as defined by the city metropolitan planning organization transportation plan.

(5) The maximum length of display shall be determined by the length of the event being advertised. Banners are permitted to be displayed one and one-half times the length of the event being advertised. The one-half amount of days is permitted to be utilized prior to the event. (Example: event is ten days, display permitted 15 days total, banners can be displayed five days prior to event.)

(6) Any aggrieved person, department, commission, board, or bureau that is affected by a decision of an administrative official in the administration of this section may appeal such decision to the city council. Such appeal must be in writing within 15 days after the decision and must be filed with the city clerk.

(g) Any sign extending over an area intended for pedestrian use shall not be less than seven feet, four inches above the finished grade below it.

(h) No sign shall be placed on any property without written consent of the owner or the owner's authorized agent.

(i) No part of any sign may protrude into the setback except as follows:

(1) If the right-of-way extends 15 feet beyond the back of the curb, a sign may be placed on the property line. A written agreement between the city and the property owner shall be initiated to ensure that the sign will be relocated at the owner's expense if the roadway is ever widened at the sign location.

(2) Real estate signs may be located within the setback; however, they shall not encroach in any way into the public right-of-way or clear sight triangles.

(j) Every sign shall be identified by a label, nameplate or trademark designating the manufacturer and installer of the sign. Signs not requiring permits shall be exempt from this subsection.

(k) No temporary or permanent sign shall be placed on public property, with the exception of signs lawfully permitted. Any unlawful sign found in a public right-of-way or on public property shall be seized, and removal is authorized.

(Ord. No. 1128, § I.7, 5-18-90; Ord. No. 2440, 3-24-08)

Sec. 36-12. Lighting.

(a) Light from any light source intended to illuminate a sign shall be shaded, shielded, or directed in such a way so that the light intensity or brightness shall not adversely affect the safe vision of pedestrian or vehicle operators on public or private streets, driveways, or parking areas, and shall not adversely affect any of the surrounding premises. Illumination from any sign shall not interfere with the effectiveness of any official traffic sign, signal or device.

(b) Signs which face residentially zoned lots having a linear distance of 75 feet or less from that zone shall not be illuminated.

(c) Signs in residential zones shall not be illuminated with the exception of house or building sign or nameplate.

(Ord. No. 1128, § I.8, 5-18-90)

Sec. 36-13. Enforcement.

(a) *Violations and penalties.* Any person who shall violate any section of this chapter shall be guilty of an offense and shall, upon conviction, be punished by a fine of not less than $50.00 and not more than $300.00 for each violation. Each day in which any violation shall occur shall constitute a separate offense. In addition, the city attorney is authorized to take all actions, both legal and equitable, necessary to ensure compliance with this chapter.

(b) *Enforcement authority.*

(1) The Sign Code Administrator or designee shall have the authority to remove any sign that is in the public right-of-way and in violation of Code. The sign owner will be contacted about the situation and will be allowed 30 calendar days to collect the removed sign or signs. After set time, any remaining sign or signs shall be recycled.

(2) The police department, through its codes enforcement division, is authorized to issue citations for violations of this chapter and to file criminal complaints in municipal court alleging violations of this chapter.

(3) The municipal court may impose a fine for each offense, not to exceed $300.00 for each day the violation is found to have occurred. In addition to any fines thus imposed, the municipal court is authorized to issue orders of the court to remove structures it finds in violation of this chapter. Failure to comply with any such orders for removal or other judgments of the municipal court, including failure to pay fines previously imposed, shall constitute contempt of court and may be separately punished at the discretion of the municipal court.

(Ord. No. 1128, § I.4.f, 5-18-90; Ord. No. 2575, 4-26-10)

Secs. 36-14--36-40. Reserved.

ARTICLE II.
ON-PREMISES SIGNS*

* **Cross References:** Licenses, taxation and miscellaneous business regulations, ch. 16.

Sec. 36-41. General Conditions.

The following general conditions apply to on-premises signs:

(1) *Accessory use sign.*

a. The primary purpose of the sign must be corporate/business identification and not advertising per se.

b. The object into which the sign is incorporated must serve a functional purpose and be an item which is normally associated with the type of business or enterprise for which it is being used.

(2) *Attached sign.* No attached sign shall extend beyond the highest point of a roofline, or project beyond the edge of any wall.

(3) *Decorations.* Any display shall be removed no later than five days after the event/holiday.

(4) *Development identification sign (permanent.).*

a. The maximum sign area shall not exceed 32 square feet.

b. The maximum height shall not exceed ten feet.

c. The sign may be placed in the public right-of-way, provided prior approval has been granted by City Manager or official designee.

d. This sign may be used in addition to any other freestanding sign allowed pursuant to this chapter.

(5) *Directional sign.* Directional signs visible from the public right-of-way (i.e., entrance/exit) shall not exceed six square feet in sign area and four feet in height.

(6) *Flags.*

a. Displays incorporating the identification of a nation, state or corporation shall follow accepted flag protocol. Only one corporate flag will be allowed per lot.

b. Displays used to serve as decoration, exclusive of decorations used in fiestas, communitywide festivals or national holidays, shall have no logo or advertising message printed or painted on them. These may be used in addition to the regular signage allowed per business.

(7) *Freestanding sign.* All signs classified as freestanding are limited to locations along street segments meeting specific zoning criteria further defined elsewhere in this chapter.

(8) *Gate entrance sign.*

a. The sign may identify the owner, resident or name of a certain parcel of property (i.e., John Doe Ranch, etc.).

b. Total sign height, including poles, shall not exceed 20 feet. The sign face itself shall not exceed three feet in height and 30 feet in width.

(9) *Information sign.* Signs visible from the public right-of-way shall have a maximum size of four square feet in sign area.

(10) *Legal notices.* These signs are exempt from the requirements of this chapter; however, they must comply with provisions for the clear sight triangle.

(11) *Pennant.* These displays may be used in addition to the regular signage allowed per business.

(12) *Point-of-sale sign.*

a. This sign shall limit its advertisement to the product, its price, and its manufacturer.

b. The cumulative sign area for these signs shall not exceed 20 square feet.

c. Each sign shall be no larger than two square feet in sign area.

(13) *Portable sign.*

a. Portable signs, although not incorporating a permanent footing in their design, shall be securely anchored to the ground to prevent overturning in high winds.

b. Portable signs shall be placed on level ground only or leveled during setup.

c. Portable signs shall for purposes of this chapter be subject to all on-premises provisions governing freestanding signs.

(14) *Product identification sign.* The sign shall be placed on the structure and shall not exceed one-third square foot in sign area.

(15) *Real estate broker identification sign.* The sign area shall not exceed two square feet.

(16) *Special use sign.*

a. The maximum number of signs allowed for each location shall be limited to one freestanding sign and one attached sign.

b. Height requirements are established in appendix 1 to this chapter. Each sign shall not exceed 20 square feet in sign area.

c. Examples where the sign requirements of this subsection would apply include the following:

1. Cemeteries located within R-1 zones.

2. Golf courses and country clubs located within an R-3 zone.

d. When special use permits are granted pursuant to Chapter 38, the requirements of this subsection shall apply.

Exception. If a special use permit is granted for a location within a zone designation (i.e., C-2, M-1) that allows greater signage, the requirements specific to that zone shall apply.

(17) *Streamers.* These displays may be used in addition to the regular signage allowed per business.

(18) *Wall sign.* No wall sign flush mounted may be extend more than 12 inches in depth out from the wall to which it is attached.

(19) *Window sign.*

a. Permanent window signs may be substituted for wall signage with a corresponding reduction of wall signage.

b. A window sign does not include merchandise or models of products or services incorporated in a window display.

(Ord. No. 1128, § C.1, 5-18-90)

Sec. 36-42. Residential zones (REM, RE, EE, R-1aM, R-1bM, R-1cM, R-1a, R-1b, R-1c).

The following sign types are permitted: development identification sign; directional sign; garage sale sign; gate entrance sign, government sign; house or building sign or nameplate; legal notices; model complex sign; national, state and corporate flags; neighborhood sign; political sign; private sale or event sign; real estate broker identification sign; real estate sign; and a special use sign, pursuant to requirements stated elsewhere in this chapter.

(Ord. No. 1128, § C.2, 5-18-90; Ord. No. 1444, 4-3-95; Ord. No. 2304, 5-15-06)

Sec. 36-43. Residential zones (R-2, R-3).

The following sign types are permitted: development identification sign; directional sign; flags/decorative; garage sale sign; government sign; house or building sign or nameplate; legal notices; model complex sign; national, state and corporate flags; neighborhood sign; political sign; private sale or event sign; real estate broker identification sign; real estate sign; and a special use sign, pursuant to requirements stated elsewhere in this chapter.

(Ord. No. 1128, § C.4, 5-18-90; Ord. No. 2304, 5-15-06)

Sec. 36-44. Flood Control zones (FC).

The following signs are permitted:

(1) One freestanding sign, one attached sign or a combination of both shall be permitted for advertising purposes only. In no event shall the total square footage of both signs exceed 32 square feet in sign area.

(2) Sign types allowed include: development identification sign; directional sign; flags/decorative; government sign; legal notices; national, state and corporate flags; point-of-sale sign; political sign; private sale or event sign; real estate broker identification sign; real estate sign; and a special use sign, pursuant to requirements stated elsewhere in this chapter.

(Ord. No. 1128, § C.5, 5-18-90; Ord. No. 2304, 5-15-06)

Sec. 36-45. Residential, Office and Commercial zones (R-4, O-1, O-2, C-1).

(a) *Attached signage.* One square foot of on-premises signage for each linear foot of exterior wall shall be allowed. The sign shall be placed on the side of the building used to calculate the square footage of the sign. The following are considered attached signs: awnings signs, canopy or marquee signs, banners, roof signs, window signs and wall signs. These attached signs are subject to the design standards of all applicable codes.

(b) *Freestanding signs.* These signs must comply with the following conditions:

(1) Locations which permit freestanding signs are determined by zoning districts along specific segments of streets. When the percentage of office, commercial or industrial zoning equals or exceeds 60 percent of the total street frontage for that segment, all criteria governing freestanding signs shall apply. When the percentage is less than 60 percent, the maximum height of freestanding signs shall be 12 feet, unless a more restrictive height limitation is mentioned elsewhere in this chapter, in which case the more restrictive height limitation shall apply.

(2) The maximum height and minimum setbacks for freestanding signs are determined by street classification. See appendix 1 to this chapter pertaining to development standards.

(3) Individual freestanding signs shall be limited to those businesses that own direct, unobstructed (on-site) access to the public street.

(4) Frontage on a controlled access public street, where under normal conditions a driveway permit would not be granted to that business, shall not be included in the calculation for freestanding signage.

(5) The size of freestanding signs is determined as follows:

Linear Street Frontage (feet)	Size Allowed (square feet)
0--100	50
101--300	75
301--600	100
>600 (see subsection (b)(6) of this section)	100

On lots with more than one street frontage, only one street frontage shall be used to calculate the permitted sign size, height and number of signs.

(6) The number of freestanding signs is limited to one per lot, except where the frontage of the lot exceeds 600 linear feet. For those lots, two

freestanding signs are permitted, provided there is a minimum distance of 200 feet between the signs.

(Ord. No. 1128, § C.6, 5-18-90; Ord. No. 1476, 9-3-95; Ord. No. 2304, 5-15-06; Ord. No. 2575, 4-26-10)

Sec. 36-46. Commercial and Industrial zones (C-2, C-3, MTech, M-1/M-2, M-3).

(a) *Attached signage.* 1 1/2 square feet of on-premises signage for each linear foot of exterior wall is permitted. The sign shall be placed on the side of the building used to calculate the square footage of the sign. The following are considered attached signs: awning signs, canopy or marquee signs, banners, roof signs, window signs and wall signs. These attached signs are subject to the design standards of all applicable codes.

(b) *Freestanding signage.* These signs must comply with the following conditions:

(1) Locations which permit freestanding signs are determined by zoning districts along specific segments of streets. When the percentage of office, commercial or industrial zoning equals or exceeds 60 percent of the total street frontage for that segment, all criteria governing freestanding signs shall apply. When the percentage is less than 60 percent, the maximum height of freestanding signs shall be 12 feet, unless a more restrictive height limitation is mentioned elsewhere in this chapter, in which case the more restrictive height limitation shall apply.

(2) The maximum height and minimum setbacks for freestanding signs are determined by street classification. See appendix 1 to this chapter pertaining to development standards.

(3) Individual freestanding signs shall be limited to those businesses that own direct, unobstructed (on-site) access to the public street.

(4) Frontage on a controlled access public street, where under normal conditions a driveway permit would not be granted to that business, shall not be included in the calculation for freestanding signage.

(5) The size of freestanding signs is determined as follows:

Linear Street Frontage (feet)	Size Allowed (square feet)
0--100	100
101--300	150
301--600	200
>600	200

On lots with more than one street frontage, only one street frontage shall be used to calculate the permitted sign size, height and number of signs.

(6) The number of freestanding signs is limited to one per lot, except where the frontage of the lot exceeds 600 linear feet. For those lots, two freestanding signs are permitted, provided there is a minimum distance of 200 feet between the signs.

(Ord. No. 1128, § C.7, 5-18-90; Ord. No. 1476, 9-3-95; Ord. No. 2304, 5-15-06)

Sec. 36-47. Business centers (various zones).

(a) *Attached signage.* For business center, 1 1/2 square feet of on-premises signage for each linear foot of exterior wall is permitted, provided that any business shall be allowed a minimum of 100 square feet of signage. The sign shall be placed on the side of the building used to calculate the square footage of the sign. The following are considered attached signs: awning signs, canopy or marquee signs, banners, roof signs, window signs and wall signs. These attached signs are subject to the design standards of all applicable codes.

(b) *Freestanding signage.* Freestanding signs must comply with the applicable freestanding sign criteria for the district they are located in.

(Ord. No. 2304, 5-15-06)

Sec. 36-48. Sign regulations in overlay zone districts.

Refer to the following Zoning Code for information regarding signs that are located within the overlay districts throughout Las Cruces including the Central Business District, the University District overlay zone, and others.

(Res. No. 92-084, § C.10, 10-19-92; Ord. No. 1725, § I, 3-1-99; Ord. No. 2304, 5-15-06, Ord. No. 2575, 4-26-10)

Sec. 36-49. Planned Unit Development Zones PUD.

(a) A newly submitted Planned Unit Development (PUD) will provide a plan for signage that is desired in the new development during the PUD review process.

(b) Any changes to the signage plan of a PUD shall provide a minor PUD amendment.

(c) A previously approved and existing PUD or any newly submitted PUD that does not present a plan for signage shall use existing sign regulations of the Sign Code. A PUD with residential land uses shall follow sign regulations for residential zones; a PUD with commercial land uses shall follow sign regulations for commercial zones; and a PUD with industrial land uses shall follow sign regulations for industrial zones. A mixed-use PUD shall follow sign regulations of the appropriate zone that fits the land use of the PUD.

(Ord. No. 2575, 4-26-10)

Secs. 36-50--36-80. Reserved.

ARTICLE III.
OFF-PREMISES SIGNS

Sec. 36-81. Attached signs.

No attached off-premises signs shall be permitted.

(Ord. No. 1128, § D.1, 5-18-90)

Sec. 36-82. Public area signs.

(a) With the approval of the city manager, bus benches and bus shelters may be placed in the public right-of-way along bus routes or in areas frequented by pedestrians. In addition, signs may be placed on benches and shelters and in landscaped medians, parks, trails, and arroyos that are adopted public areas.

(b) No commercial (other than a business name as specified in (c) below) or political advertising shall be placed upon bus benches, bus shelters, or in other public areas.

(c) Benches, shelters, and medians donated or maintained by individuals or businesses may have signs designed by the city with the inscription "adopted by..." and further regulated by:

(1) The sign on benches shall be no larger than three inches high by 18 inches long.

(2) The sign on shelters shall be no larger than 12 inches high by 48 inches long.

(3) The sign in medians shall be no larger than 12 inches high by 18 inches long.

(4) The sign in parks, trails, and arroyos shall be no larger than 18 inches high by 24 inches wide.

(d) Bus benches are exempt from the location restrictions for freestanding signs only when they are located at designated bus stops.

(e) This section shall not apply to any benches placed under the terms of any contract in effect on the effective date of the ordinance from which this chapter derives.

(Ord. No. 1128, § D.2, 5-18-90; Ord. No. 2141, § I, 10-4-04)

Sec. 36-83. Billboards.

(a) Billboards shall be located only in areas zoned C-2, C-3, M-1/M-2, or M-3.

(b) Billboards may be located only along the following roadways and only along street segments having a minimum of 75 percent office, commercial or industrial zoning. (A street segment is defined as that length of a roadway located between intersections of two collector or higher classified roadways.)

Interstate 10	Interstate 25
Bataan Memorial East and West (west of Porter Drive)	
Main Street	Picacho Avenue
Amador Avenue	Lohman Avenue (west of Interstate 25)
Solano Drive	El Paseo Road
Valley Drive	Motel Blvd (south of Picacho)
Telshor Blvd (north of Lohman)	

(c) Total sign area, spacing, height and setbacks shall be subject to the following requirements:

(1) Billboards located along interstate highways shall not exceed 400 square feet of total sign area, shall be spaced a minimum of 1,000 feet away from any other billboard and shall not exceed 40 feet in height measured from ground level.

(2) All other billboards shall not exceed 300 square feet of total sign area, shall be spaced a minimum of 1,000 feet away from any other billboard and shall not exceed 30 feet in height measured from ground level. There shall be a minimum clearance of 15 feet measured from the ground level to the bottom of the billboard face.

(3) A maximum of two faces, parallel back-to-back is permitted, provided both faces are of the same size and attached to the same pole for support. Sign faces must be relatively perpendicular to the designated roadway and each face shall not advertise more than one message.

(4) Billboards shall be supported by a maximum of two upright poles.

(5) Vertical or horizontal stacking of billboards is prohibited.

(6) Billboards shall be set back a minimum of 15 feet from the property line fronting along the designated roadway. Except for billboards fronting along interstate highways, the setback from the designated roadway shall not exceed one third of the property

depth. In each case there shall be a minimum of five feet from all other property lines measured from the property line to any portion of the billboard structure.

(7) Billboards shall have a minimum sign area of 72 square feet.

(d) A legally permitted billboard which follows all associated standards for billboards is allowed to advertise a business, product, service, or activity that is located on the same premises.

(Ord. No. 1128, § D.3, 5-18-90; Ord. No. 2304, 5-15-06)

Sec. 36-84. Garage, private sale or event signs.

(a) Off-premises signs may be used to advertise any garage sale, private sale or event, provided that the signs are not over three square feet in sign area and are used only during the duration of the event.

(b) The person erecting the sign and the property owner at the sign location shall be responsible for sign removal and all other requirements concerning signs.

(Ord. No. 1128, § D.4, 5-18-90)

Sec. 36-85. Government signs.

(a) Traffic control and similar signs are exempt from all requirements of this chapter.

(b) Building identification signs and similar signs do not require permits; however, they must meet the numerical requirements of this chapter.

(Ord. No. 1128, § D.5, 5-18-90)

Sec. 36-86. Political signs.

(a) No individual political sign shall exceed 32 square feet in sign area.

(b) All political signs may be erected no sooner than 90 days before the election and/or caucus to which they pertain and shall be removed within ten days following the same election and/or caucus.

(c) Advertising on a duly permitted billboard shall be exempt from the size and time limits stated in this section.

(d) Political signs are permitted to be placed on fences/walls (e.g. chain link fences, retaining walls, rock walls), but are not permitted to be placed in clear sight

triangles or in a manner that would prevent clear sight of vehicles (See section 32-405 of the Municipal Code).

(Ord. No. 1128, § D.6, 5-18-90; Ord. No. 2111, §§ I, II, 6-21-04)

Sec. 36-87. Vehicle signs.

Off-premises vehicle signs are permitted provided the vehicle is:

(1) For sale and the purpose of the sign relates to its sale;

(2) Placed and is for some purpose other than advertising; or

(3) Contributing to the legitimate purposes of the business for which it is used.

(Ord. No. 1128, § D.7, 5-18-90) **Cross References:** Traffic, Ch. 27.

Sec. 36-88. Athletic field signs.

(a) Signs shall be permitted to be displayed on the inside of fences surrounding individual athletic fields, with the side facing the playing field.

(b) Each sign shall not exceed 32 square feet in sign area.

(c) The signs shall not be permitted to extend above or beyond the edges of the fence.

(d) Freestanding signs and attached signs are not permitted.

(Ord. No. 1128, § D.8, 5-18-90; Ord. No. 1526, 4-1-96)

Sec. 36-89. Neighborhood signs.

(a) The sign may be placed on private property, provided prior approval has been granted by the property owner.

(b) The maximum sign area shall not exceed 4 square feet. The maximum height shall not exceed 3 feet.

(c) A maximum of one (1) sign is allowed per property.

(d) Signs shall not conflict with any traffic control nor the clear sight triangle.

(e) Signs may not be placed any further than one-half (1/2) a mile from the neighborhood to which they pertain to.

(f) A maximum of four (4) signs shall be permitted per neighborhood.

(g) Valid sign permits shall be obtained or renewed annually for each sign.

(h) Signs will be maintained by the party responsible for erecting the signs.

(Ord. No. 2304, 5-15-06; Ord. No. 2575, 4-26-10)

Sec. 36-90--36-115. Reserved.

ARTICLE IV.
TEMPORARY SIGNS

Sec. 36-116. Construction/renovation signs.

(a) Construction/renovation signage shall not exceed 64 square feet in sign area, and shall not be erected until a building permit has been secured. The sign shall be removed not later than 14 days after the issuance of a certificate of occupancy or the building permit expires.

(b) Signs less than 16 square feet in sign area do not require a sign permit and shall not be assessed a permit fee.

(c) Signs which exceed 16 square feet in sign area require a sign permit and shall be assessed the applicable permit fee.

(Ord. No. 1128, § E.1, 5-18-90) **Cross References:** Buildings and Building Regulations, Ch. 30.

Sec. 36-117. Real estate signs.

(a) *Residentially zoned lots or parcels.* Real estate signs are permitted for residentially zoned lots or parcels as follows:

(1) For less than 1.00 acre: one sign per street frontage not to exceed four square feet in sign area per sign. The sign shall not exceed seven feet in height.

(2) For 1.01 to 5.00 acres: one sign per street frontage not to exceed 32 square feet in sign area per sign. The sign shall not exceed eight feet in height.

(3) For 5.01 to 10.00 acres: two signs not to exceed 32 square feet in sign area per sign. The sign shall not exceed eight feet in height.

(4) For greater than 10.00 acres: three signs not to exceed 32 square feet in sign area per sign. The sign shall not exceed eight feet in height.

(b) *All other zoned lots or parcels.* Real estate signs for all other zoned lots or parcels are permitted as follows:

(1) For less than 1.00 acre: one sign per street frontage not to exceed 16 square feet in sign area per sign. The sign shall not exceed eight feet in height.

(2) For 1.01 to 5.00 acres: one sign per street frontage not to exceed 32 square feet in sign area per sign. The sign shall not exceed ten feet in height.

(3) For 5.01 to 10.00 acres: two signs not to exceed 32 square feet in sign area per sign. The sign shall not exceed 15 feet in height.

(4) For greater than 10.00 acres: three signs not to exceed 64 square feet in sign area per sign or two signs not to exceed 128 square feet in sign area per sign. The sign shall not exceed 15 feet in height.

(c) *Real estate directional signs.* These signs shall not exceed six square feet in sign area.

(d) *Model complex signs.* Model complex signs shall be located on the project site and shall conform to the following:

(1) One sign per complex not to exceed 32 square feet in sign area.

(2) One sign per model not to exceed four square feet in sign area.

(3) Signs are to be removed when the complex ceases to be a model home complex.

(e) *Removal.* Signs shall be removed 72 hours after closing of sale or lease of property.

(f) *Location.* No real estate sign shall be erected in the public right-of-way or in the clear sight triangle.

(g) *Permits.*

(1) Signs which do not exceed 16 square feet in sign area do not require a sign permit and shall not be assessed a permit fee.

(2) Signs which exceed 16 square feet in sign area require a sign permit and shall be assessed the applicable permit fee.

(Ord. No. 1128, § E.2, 5-18-90)

Sec. 36-118. Commercial promotional displays.

In addition to authorized attached and freestanding signs, occasional events for commercial promotional displays requiring special advertising shall be subject to the following:

(1) Each business shall be limited to one freestanding and three attached signs. Each sign shall not exceed 100 square feet in size.

(2) Displays incorporating balloons, streamers, flags and pennants will be permitted and are not limited in size and number.

(3) Each business shall be allowed one permit for a grand opening display during its first six months of operation. The permit for this display shall be for 20 consecutive days.

(4) Each business shall be allowed four promotional displays during each calendar year. The permit for each of these displays shall be for ten consecutive days.

(5) Each business shall be allowed one bona fide going out of business display. The permit for this display shall be for 60 consecutive days.

(6) The applicant shall provide to the sign administrator the name and address of the business where the display is to be placed and the first day of the display. No portion of a display (i.e., structure or sign) shall be erected prior to the first day of the event as stated on the permit. All displays shall be removed not later than the permissible time limit stated in this section. A permit will be issued to the applicant and will remain in effect for the duration of that event. No permit fee will be assessed. A new permit is required for each event.

(Ord. No. 1128, § E.3, 5-18-90; Ord. No. 1508, 2-5-96)

Cross References: Licenses, Taxation and Miscellaneous Businesses Regulations, Ch. 16.

Sec. 36-119. Residential promotional displays.

For an open house or other similar showing, the following residential promotional displays and conditions shall apply:

(1) Displays incorporating pennants, flags, streamers, banners, open house signs, welcome signs and other like signs will be allowed.

(2) The sign display may be erected any time on the day prior to the event and must be removed within 24 hours following the event.

(Ord. No. 1128, § E.4, 5-18-90)

APPENDIX 1.
DEVELOPMENT STANDARDS

TABLE 1
MAXIMUM SIGN HEIGHT BY STREET CLASSIFICATION (IN FEET)

Zone → ↓ Street Class		R-3	R-4, O-1	O-2, C-1	C-2, MT, M-1/M-2,	C-3, M-3	all other zones
local		0	6	6	18	30	0
collector		6	12	18	18	30	6
minor arterial		6	12	18	18	30	6
principal arterial		12	18	18	30	30	6

NOTE: Freestanding signs which are allowed by right and erected in the zones listed in table 1 shall follow those height requirements enumerated in the table, unless specific height requirements are stated elsewhere in this chapter.

(Ord. No. 1128, app. 1, table 1, 5-18-90; Ord. No. 1444, 4-3-95; Ord. No. 2304, 5-15-06; Ord. No. 2575, 4-26-10)

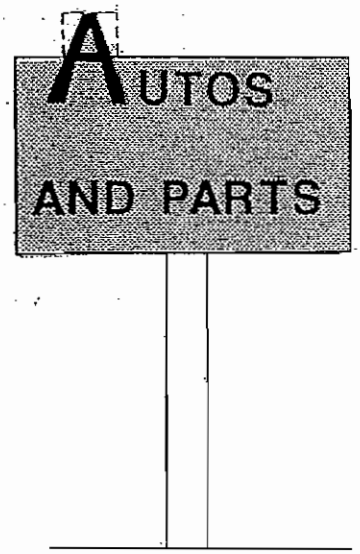
TABLE 2
MINIMUM SETBACK BY STREET CLASSIFICATION

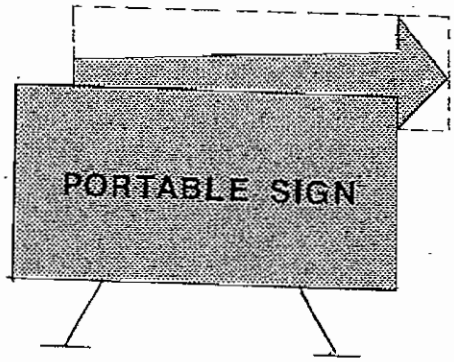
Street Class	Setback	Setback
Local	10 feet from property line	5 feet side yard
Collector	12 feet from property line	5 feet side yard
Minor arterial	15 feet from property line	5 feet side yard
Principal arterial	15 feet from property line	5 feet side yard

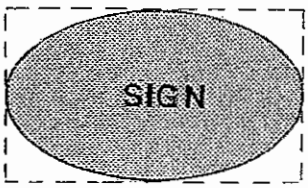
(Ord. No. 1128, art. 1, table 2, 5-18-90)

APPENDIX 2.
EXAMPLES AND ILLUSTRATIONS

DETERMINING SIGN AREA





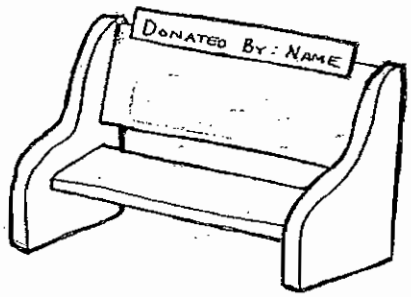


--- Indicates boundary to be used to calculate sign area in the event the applicant does not provide the actual square footage of the sign.

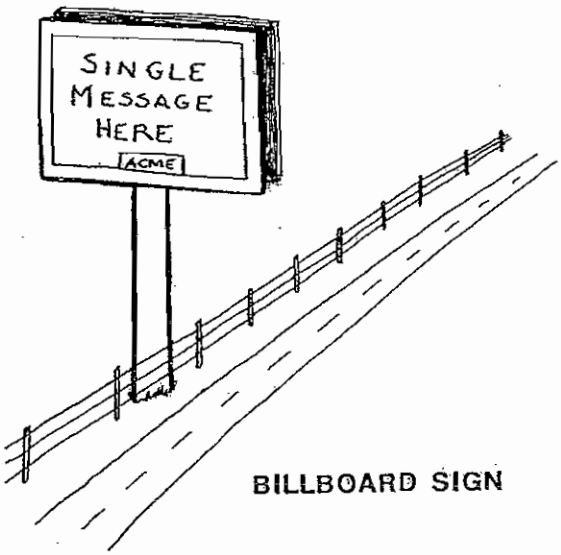
SHADED AREA INDICATES SIGN AREA

OFF-PREMISE SIGNS

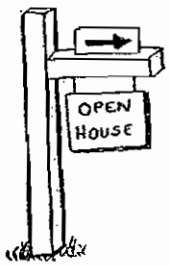
(FOR ILLUSTRATIVE PURPOSES ONLY)



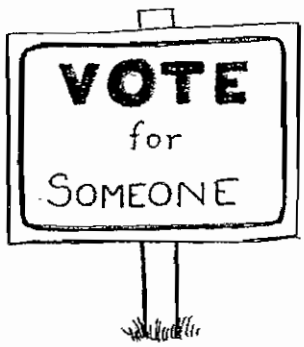
BENCH SIGN



BILLBOARD SIGN



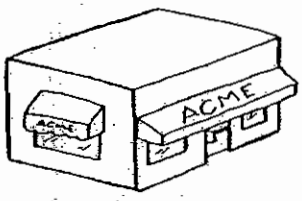
REAL ESTATE DIRECTIONAL SIGN



POLITICAL SIGN

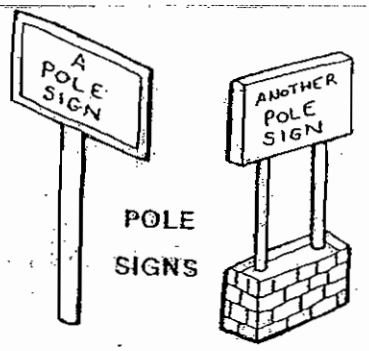
ON-PREMISE SIGNS

(FOR ILLUSTRATIVE PURPOSES ONLY)

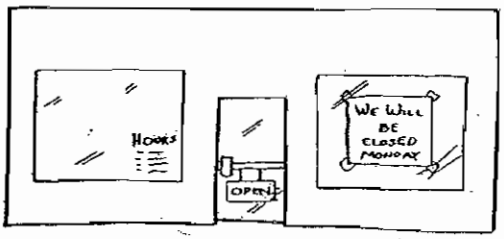


AWNING/CANOPY/MARQUEE SIGNS

GROUND SIGN



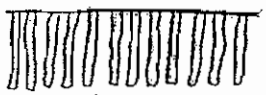
POLE SIGNS



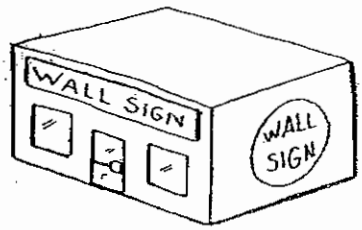
INFORMATION SIGNS

BANNER

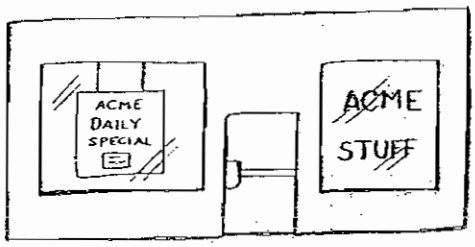
PENNANTS



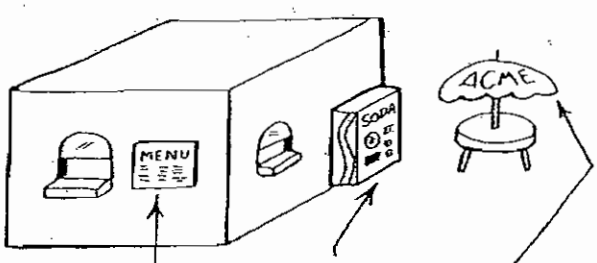
STREAMERS



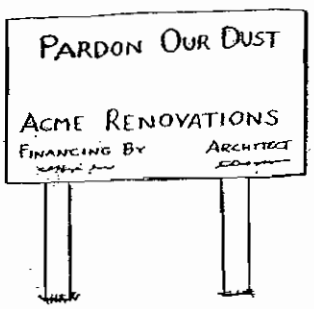
WALL SIGNS



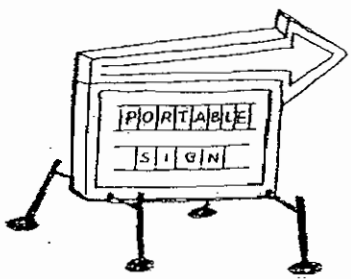
WINDOW SIGNS



ACCESSORY USE SIGNS



CONSTRUCTION/RENOVATION SIGN



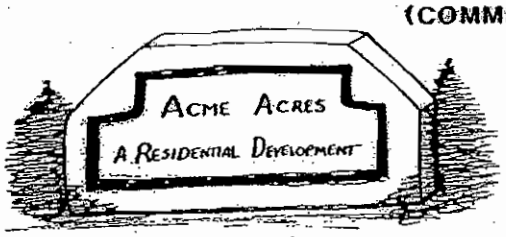
PORTABLE SIGN

ON-PREMISE SIGNS

(FOR ILLUSTRATIVE PURPOSES ONLY)

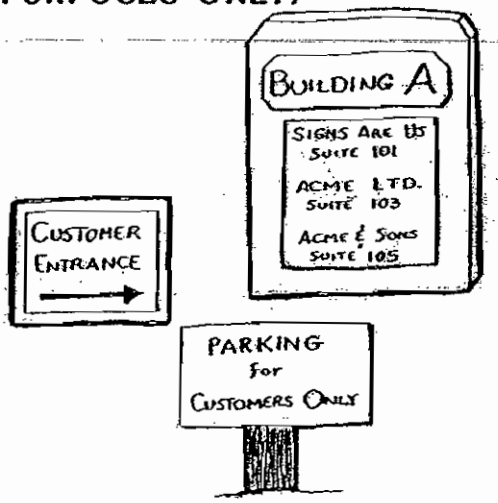
DEVELOPMENT IDENTIFICATION SIGN

(COMMERCIAL)



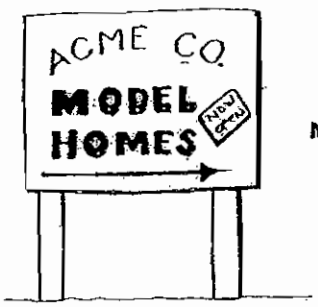
DEVELOPMENT IDENTIFICATION SIGN

(RESIDENTIAL)

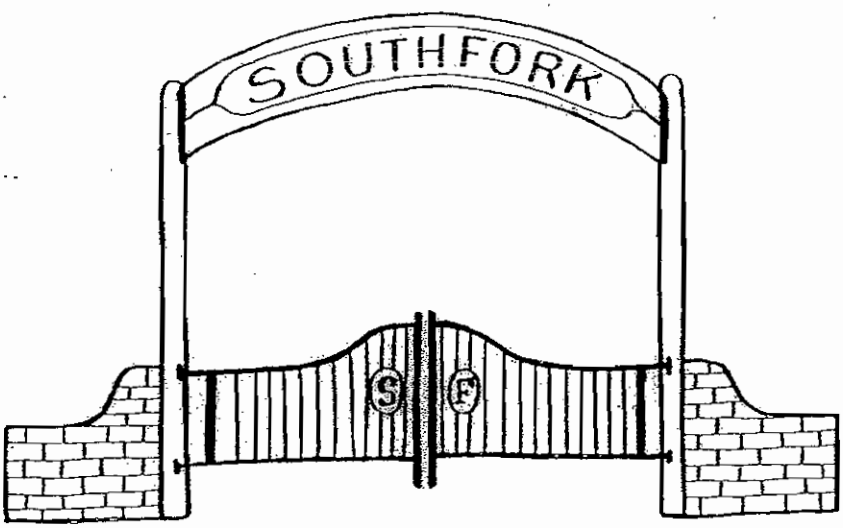


DIRECTIONAL SIGNS

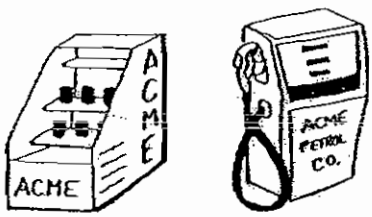
LEGAL NOTICES



MODEL COMPLEX SIGN

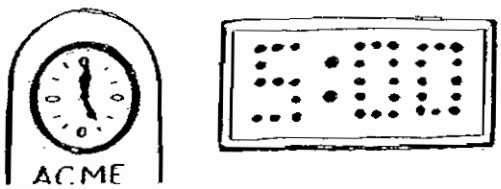


GATE ENTRANCE SIGN



POINT-OF-SALE SIGNS

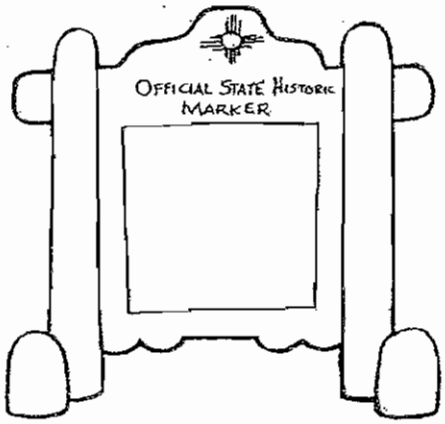
TIME-AND-TEMPERATURE SIGNS



ON- OR OFF-PREMISE SIGNS

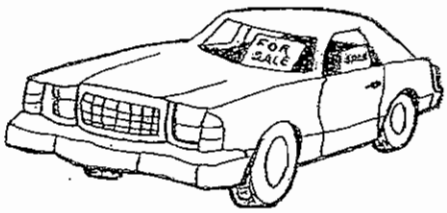
(FOR ILLUSTRATIVE PURPOSES ONLY)

GARAGE SALE SIGN

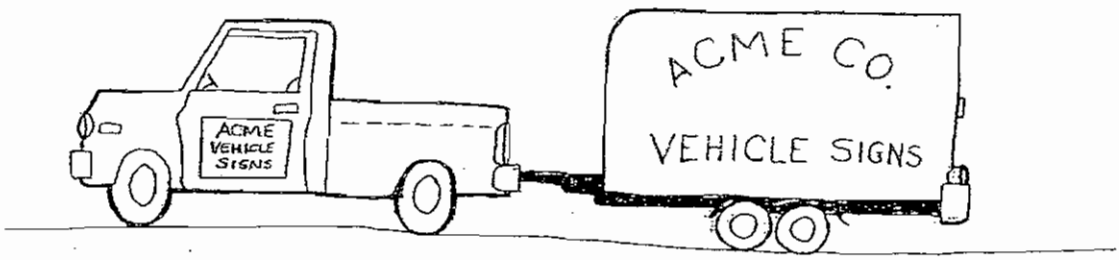


GOVERNMENT SIGNS

REAL ESTATE SIGNS



VEHICLE SIGN



VEHICLE SIGNS

ATTACHMENT "C"

Resolution 99-212 – Spectacular Sign Appeal

RESOLUTION NO. 99-212

A RESOLUTION REVERSING A DENIAL DECISION OF THE BOARD OF ADJUSTMENT ON AN APPEAL OF A STAFF INTERPRETATION REGARDING SPECTACULAR SIGNS. SUBMITTED BY LARRY RAMIREZ, ON BEHALF OF ALLEN THEATRES, INC. (CASE A1380).

The City Council is informed that:

WHEREAS, Larry Ramirez has submitted a request appealing a denial decision of the Board of Adjustment; and

WHEREAS, a public hearing was held on October 13, 1998, in accordance with Paragraph 2.4F and Ordinance 1267, Appendix G of the Las Cruces Zoning Code (1981, as amended). The Board of Adjustment heard and denied the following appeal of a staff interpretation:

> Case A1380: A request to appeal/overturn a staff interpretation that considers a LED Information Board a Spectacular Sign. Spectacular Signs are Prohibited under Section B, H.1, and H.3 of the Las Cruces Sign Code (Article XIII of the 1981 Las Cruces Zoning Code, as amended). Submitted by Allen Theatres, Inc.

The vote on the motion to grant the appeal was no votes in favor and five votes against the request (one member absent and one member abstained).

NOW, THEREFORE, Be it Resolved by the Governing Body of the City of Las Cruces:

(I)

THAT, granting this appeal of a staff interpretation is in accordance with Section 2-196, Criteria for Decisions of Appendix G of the Las Cruces Zoning Code (1981, as amended).

(II)

THAT, the denial decision by the Board of Adjustment is hereby reversed.

(III)

THAT, the following interpretation is hereby granted: an automated, automatically changing advertising LED Information Board is not a Spectacular Sign, and therefore, not prohibited under Section H of the Las Cruces Sign Code (Article XIII of the 1981 Las Cruces Zoning Code, as amended).

(IV)

THAT, City Staff is hereby authorized to do all deeds necessary in the accomplishment of the hereinabove.

DONE AND APPROVED this 7th day of December, 1998.

APPROVED:

Mayor Ruben A. Smith

ATTEST:

City Clerk
(SEAL)

VOTE:

Mayor Smith: aye
Councillor Frietze: absent
Councillor Gustafson: aye
Councillor Valencia: aye
Councillor Stevens: aye
Councillor Tomlin: aye
Councillor Haltom: aye

Moved by: Stevens

Seconded by: Valencia

APPROVED AS TO FORM:

Asst City Attorney

LAW OFFICES OF
LARRY RAMIREZ, P.A.
SUITE 332 • FIRST NATIONAL BANK TOWER
500 SOUTH MAIN • LAS CRUCES, NEW MEXICO 88001
PHONE 505/524-7811 • FACSIMILE 505/524-4252

October 26, 1998

Las Cruces City Commission
Post Office Box 20000
Las Cruces, NM 88004-9002

RE: CASE NO: A1380/BOARD OF ADJUSTMENT
ALLEN THEATER INC. REQUEST FOR VARIANCE

Dear Sirs:

This letter will constitute our appeal of the Board of Adjustment's denial of a variance with regard to the City of Las Cruces site ordinance section H.3 and B and Section I.6. Section H.3 reads that a flashing, rotating, animated sign, or a sign with intermittent or varying intensity illumination, for the deliberate or resulting from a defect in the sign or light source is prohibited. The requested variance is for a sign located at the Telshor 12 Cinemas adjacent to the K-Mart Shopping Center located on North Main Street, and bordering Interstate Highway-25 on the West and North Telshor Boulevard on the Southeast. The area surrounding the theaters is entirely commercial in nature.

There are several reasons why this appeal should be granted. First of all it does not appear that the sign in question violates the intent of the ordinance, It is clear that intent of the ordinance is to prevent the use of a "spectacular sign" and the sign in question is not a flashing, rotating, or animated sign with intermittent or varying intensity illumination. It appears that the intent of the ordinance was to prevent the "Las Vegas style" sign which is a sign intended to be an attention getting device or otherwise intended to draw customers from a street area to the business. The sign in question is visible and legible from the maximum distance of 150 feet from the sign and is designed as part of the buildings canopy/marque signage and is an integral part of the overall buildings design. As such the sign would not be legible from either Telshor Boulevard, which is 510 feet away, North Main St., or Interstate Highway-25.

The text on the sign is three inches high and the information is displayed for approximately 20 seconds, the intensity of the illumination does not change. The information displayed indicates what movies are playing, the times at which the movies can be seen and the available seating, and ticket cost. This sign in question was designed a part of the overall building canopy/marquee sign and was included in the total allowable area for attached signage. Because this sign provides information pertinent to the type of business, i.e. (Cinemas), it is in our opinion that the sign would qualify as a "Accessory use sign", which as noted in Section G.1-Signs not Requiring Permits, this sign would not require the

issuance of a permit in order to be allowed. Due to the number of auditoriums located at the Telshor 12 Theater the signage that would be needed to display all the information that the LED sign currently displays would be extremely large. There was no way to place a marquee with changeable letters that would fit on the building in a way that looked good and was not dangerous to the employees to change. The type of sign that is in use, the LED sign, is the sign of choice among theater companies to display all of the information that is demanded by customers. The information is linked to the computer ticketing system

The sign was not installed to advertise and is not animated to attract attention to the business. Its only purpose is to give reconfirming information about times and available seats for the movie that the customers come to the theater to see.

Finally, this portion of the sign ordinance may be so vague as to the unenforceable. It is our opinion that this portion of the ordinance sign permits too much subjectivity of opinion with regard to its enforcement.

In support of this appeal I enclose various exhibits which were attached to the Board of Adjustments Justification Statement for the further review of the City Commission in this regard, along with the letter of denial of our request for variance in this matter. Your consideration in this regard is appreciated.

Very truly yours,

Larry Ramirez

City of Las Cruces

October 15, 1998
L-98-487

Mr. Larry Allen
Allen Theaters, Inc.
133 Wyatt Drive, Suite #1
Las Cruces, NM 88001

Re: Case A1380

Dear Mr. Allen:

This letter is the written decision for the staff interpretation appeal request which was heard by the Board of Adjustment on Tuesday, October 13, 1998.

SUBJECT: A request to appeal/overturn a staff interpretation that considers a LED Information Board a Spectacular Sign. Spectacular Signs are Prohibited under Section B, H.1, and H.3 of the Las Cruces Sign Code (Article XIII of the 1981 Las Cruces Zoning Code, as amended).

DECISION: The appeal was DENIED.

Upon DENIAL of a request, you may appeal the denial decision. You have fifteen (15) days from the date of the denial decision to appeal to City Council. Upon appeal, the appellant is required to submit a written and detailed statement on the grounds for the appeal. Said statement and the $100 appeal fee shall be submitted to and received by the Planning Department no later than fifteen (15) days from the date of the denial decision by the Board of Adjustment.

BOARD OF ADJUSTMENT

Tommy Garcia

Tommy Garcia
Chairperson

AN EQUAL OPPORTUNITY EMPLOYER
P.O. Box 20000 LAS CRUCES, NEW MEXICO 88004-9002 Phone (505) 541-2000

City of Las Cruces

TO: BOARD OF ADJUSTMENT MEMBERS

FROM: LANI RUTH, ASSOCIATE PLANNER/SIGN ADMINISTRATOR

DATE: OCTOBER 5, 1998

SUBJECT: Case A1380: A request to appeal/overturn a staff interpretation that considers a LED Information Board a Spectacular Sign. Spectacular Signs are Prohibited under Section B, H.1, and H.3 of the Las Cruces Sign Code (Article XIII of the 1981 Las Cruces Zoning Code, as amended). Submitted by Allen Theatres.

General Information. Sometime in May, 1998, a sign was installed without a permit at the Telshor 12 Cinemas, located at 2811 North Telshor Boulevard. The sign is 32 square feet and serves as a means of advertising to the Cinemas' customers, displaying detailed information about prices, show times, and available seating. The sign, through a lighted display system (called LED), displays six lines of three inch letters. Each six lines of information is displayed for approximately 20 seconds and then automatically changes to the next six lines. The sign is attached to the building and is located near the entrance to the theater, over 500 feet from the nearest right-of-way, Telshor Boulevard. It appears that the applicant assumed this sign was an accessory use sign, which is a permissible sign under the Sign Code and does not require a sign permit.

Findings. The Zoning Code, per Section 2.4A, allows the Board of Adjustment to hear cases and make final decisions regarding interpretations by staff. These decisions apply to all properties and in this case, all applicable signage issues whether past, present, or future.

Staff finds that several sections of the Sign Code apply to the interpretation that the LED Information Board is a spectacular sign, which is prohibited within the Sign Code. "Spectacular Sign" is defined within Section B of the Sign Code and the definition reads as follows: any sign which oscillates, rotates, flashes, varies in intensity or in color, or automatically changes advertising, or is animated or equipped with a glaring or rotating strobe light, or with spotlights. This is a comprehensive definition for a sign that has moving parts or blinking light effects. The LED Information Board in question does exhibit a number of these characteristics. As such, staff finds that the LED Information Sign displayed at the Telshor 12 Cinemas is a spectacular sign.

AN EQUAL OPPORTUNITY EMPLOYER
P.O. Box 20000 LAS CRUCES, NEW MEXICO 88004-9002 Phone (505) 541-2000

It is important to realize that the term "spectacular sign" describes the characteristics of a sign and is not necessarily a sign type. Therefore, it is possible to have an attached wall sign or freestanding pole sign (types of signs) that exhibit spectacular sign characteristics. For both these sign types, the spectacular sign characteristics cause them to be prohibited under the Sign Code.

Other than the definition, the actual words "spectacular sign" are not used elsewhere in the Sign Code. Additionally, spectacular signs (LED Information Boards) are not identified as permitted signs anywhere in the Code. Section H.1 of the Sign Code states that any sign not expressly permitted within the Code is prohibited.

In further support of staff's interpretation, please refer to the Sign Code's prohibited sign list where reference is made to spectacular sign characteristics (Section H.3). While the citing does not specifically state "spectacular sign", it has been interpreted that the prohibition is referring to the characteristics of a spectacular sign. Section H.3 of the Sign Code reads as follows: a flashing, rotating, or animated sign, or a sign with intermittent or varying intensity of illumination, whether deliberate or resulting from a defect in the sign or light source. Clearly, the subject sign displays these characteristics and was therefore found to be prohibited.

Although the applicant has assumed that the LED Information Sign would be categorized as an accessory use sign, which is a permitted sign type, staff finds that an accessory use sign's primary purpose is to identify the corporate/business entity and not advertise per se. Additionally, the sign must be incorporated into an object which serves a functional purpose such as a Coca-Cola machine or Wienerschnitzels' umbrellas. In this case, the sign's only function is advertising. The definition of accessory use sign includes any sign which is printed on or included in the design of any object which cannot be construed as being a building or freestanding sign.

In the applicant's request, it is argued that the sign is located a distance of approximately 510 feet from the public right-of-way. While this may be true, the Sign Code does not make allowances or exceptions for prohibited signs when using distance criteria.

Finally, staff finds that initial notification from the City Codes Enforcement Department (letter attached) to the applicant included several options for correction of the existing Sign Code violation. These options included removing the sign, adjusting the programming of the sign so that it never changes advertising message, or relocating the sign to the inside of the building (not attached to the window or window sill). One additional option, not included in the letter, but later discussed with the applicant was pursing an appeal to staff's interpretation of the Sign Code; the option which has brought this case to the Board of Adjustment.

For clarification:

Voting "yes" on this case/request will essentially overturn staff's interpretation of the Sign Code and will permit the display of this sign and others similar to it.

Voting "no" on this case/request will uphold staff's position on the interpretation and will not permit this sign, or any other displays of spectacular signs in the future.

Staff will be available at the October 13, 1998 Public Hearing for a brief presentation and any questions. Attached are pertinent sections of the Sign Code referred to in this document.

B. DEFINITIONS

(see Appendix 2 for examples and illustrations)

ABANDONED SIGN - an on- or off-premise sign which no longer directs, promotes, or advertises a bona fide business, lessee, owner, product, or activity conducted, or product or service available on the premises where such sign(s) is displayed.

* **ACCESSORY USE SIGN** - any sign which is printed on or included in the design of any object which cannot be construed as being a building or freestanding sign.

ADVERTISING - the action of calling something to the attention of the public by verbal or visual presentation.

ATHLETIC FIELD - a wide stretch of open land used for outdoor games such as baseball, football and soccer.

ATTACHED SIGN - any sign which is fastened to, connected to, or painted on, and wholly or partially supported by a building.

AWNING - a hood or cover which projects from the wall of a building and is composed of rigid or non-rigid materials.

AWNING SIGN - a sign which is fastened to or painted on an awning.

BANNER - a sign composed of lightweight, flexible material on which letters, symbols or pictures are painted or printed.

BENCH SIGN - any sign affixed to or painted on a functional bench.

BILLBOARD - an off-premise sign directing attention to a business, activity, commodity, service, entertainment, or communication, none of which may be conducted, sold or offered on the premises where the billboard is located.

BONUS - an allowance for additional sign area as an incentive to reduce the legal height permitted, or to remove nonconforming signs.

BUSINESS/SERVICE CENTER - a group of two or more businesses planned, constructed, owned and managed independently or as a total entity which share access, parking, or landscaping.

CANOPY (or MARQUEE) - a permanent roof-like shelter extending from part or all of a building or independent of a building.

CANOPY SIGN - a sign attached to or painted on a canopy.

CITY - the City of Las Cruces, New Mexico.

REAL ESTATE SIGN - a sign intended to advertise the financing, development, sale, transfer, lease, exchange or rent of real property or properties.

REAL ESTATE BROKER IDENTIFICATION SIGN - a sign used at a broker's residence for identification purposes as prescribed by state law.

REAL ESTATE DIRECTIONAL SIGN - a sign which advertises or directs attention to real property or properties not available on the premises where the sign is located.

ROOF SIGN - any sign which is attached to the roof of a building or structure.

SETBACKS - the distances required from the property line or from other buildings/structures or businesses.

SHOPPING CENTER - a group of commercial establishments planned, constructed and managed as a total entity with customer and employee parking provided on-site, provision for goods delivery separated from customer access, aesthetic considerations and protection from the elements.

SIGN - any advertisement, announcement, direction or communication produced in whole or in part by the construction, erection, attachment or placing of a structure or object on any land, or on any other structure, or produced by painting on, posting or placing any printed, lettered, pictured, figured or colored material on any building, structure or surface.

SIGN ADMINISTRATOR - a City employee so designated to administer and enforce the terms and conditions of this Article, the codes, and all other provisions of laws pertaining to signs.

SPECIAL USE SIGN - any sign intended for use by establishments requiring a Special Use Permit pursuant to the Zoning Code.

* **SPECTACULAR SIGN** - any sign which oscillates, rotates, flashes, varies in intensity or in color, or automatically changes advertising, or is animated or equipped with a glaring or rotating strobe light, or with spotlights.

STREAMERS - a display made of light, flexible material, consisting of long, narrow, wavy strips having no logo or advertising message printed or painted on them.

STRUCTURAL REQUIREMENTS - the safety standards which apply to those signs which are governed by the requirements in the Uniform Building Code and other companion documents.

TEMPERATURE/TIME/DATE SIGN - any sign with the purpose of displaying the temperature, time, date and/or logo/name.

TEMPORARY SIGN - any sign intended for a limited period of display.

C. ON-PREMISE SIGN PROVISIONS

1. GENERAL CONDITIONS

a. Accessory use sign

(1) The primary purpose of the sign must be corporate/business identification and not advertising per se.

(2) The object into which the sign is incorporated must serve a functional purpose, and be an item which is normally associated with the type of business or enterprise for which it is being used.

b. **Attached sign**

(1) No attached sign shall extend beyond the highest point of a roof line, or project beyond the edge of any wall.

c. **Decorations**

(1) Any display shall be removed no later than five days after the event/holiday.

d. **Development identification sign** (permanent)

Churches OK on rock walls

attached or free (not both)

(1) Maximum sign area shall not exceed 32 square feet.

(2) Maximum height shall not exceed ten feet.

(3) Sign may be placed in the public right-of-way provided prior approval has been granted by City Council.

(4) This sign may be used in addition to any other freestanding sign allowed pursuant to this Article.

e. **Directional sign**

(1) Directional signs visible from the public right-of-way (i.e. entrance/exit) shall not exceed six square feet in sign area and four feet in height.

f. **Flags**

(1) Displays incorporating the identification of a nation, state or corporation shall follow accepted flag protocol. Only one corporate

21. Real estate broker identification signs

22. Real estate directional signs

23. Real estate signs (those not exceeding 16 square feet in sign area)

24. Streamers

25. Vehicle signs

H. PROHIBITED SIGNS

1. Any sign not expressly permitted within this Article is prohibited.

2. A sign placed or painted on any motor vehicle, recreational vehicle, trailer or other movable device that reasonably indicates the use of such vehicle, trailer or device as a sign is prohibited. This includes the parking of such vehicle, trailer or device in such a manner as to constitute a sign. This does not include vehicles, etc. used in the course of normal business activities.

3. A flashing, rotating or animated sign, or a sign with intermittent or varying intensity of illumination, whether deliberate or resulting from a defect in the sign or light source. (aka: spectacular sign)

4. Any sign constructed to resemble any official marker or sign normally erected by City, State or Federal Government agency or a sign using words, phrases, symbols or characters in such a manner as to interfere with, mislead or confuse traffic.

5. A sign advertising activities that are illegal according to Federal or State laws, rules or regulations and County or City ordinances or resolutions.

6. Any sign erected on, attached to or painted on retaining walls, fences, rocks or natural features. This prohibition shall not include development identification signs placed on walls used for landscaping purposes and athletic field signs as defined in Section D.8 of this Article.

7. Any sign illegally placed, constructed or maintained.

City of Las Cruces

BOARD OF ADJUSTMENT APPLICATION

Planning Department Phone No. : 526-0620 575 S. Alameda Boulevard

THE PROPERTY OWNER OR ITS AGENT MUST ATTEND THE PUBLIC HEARING.

Meeting Date: OCTOBER 13, 1998 Case No: A1380

Property Owner (s) ALLEN THEATRES, INC. - LARRY ALLEN Phone -Wk (505) 524-7933 Phone - ~~Hm~~ FAX (505) 527-0068

133 WYATT DRIVE, SUITE #1, LAS CRUCES, 88004

Name, Mailing Address, City, State, Zip

Applicant RUSSELL ALLEN - GENERAL MANAGER Phone -Wk (505) 524-7933

133 WYATT DRIVE, SUITE #1 LAS CRUCES, 88004 Phone - ~~Hm~~ FAX (505) 527-0068

Name, Mailing Address, City, State, Zip

REQUEST: (SEE EXHIBIT "E")

I AM REQUESTING A "STAFF INTERPRETATION APPEAL" OF THE CODE ENFORCEMENT DEPARTMENT'S INCLUSION OF THE ACCESSORY USE SIGN IN THE CANOPY/MARQUE BUILDING SIGN AS A "PROHIBITED SIGN AS DEFINED IN (SECTION H.3) NOTED IN THEIR LETTER OF JULY 24, 1998, FROM LISA MIZRAHI

ADDRESS OF VARIANCE PROPERTY SEE EXHIBIT "D" (MOY SURVEYING, INC.)

Legal Description Attached.

(X) Lot — Block — Subdivision COOGAN - GREER SUBDIVISION #1

( ) Metes and Bounds Description and Survey Plat Attached

8.5002 A RE TRACT BEING PARCEL 3 FILED SEPT. 22, 1989 IN PLAT RECORD 16, PAGE 130, DONA ANA COUNTY RECORDS CITY OF LAS CRUCES, N.M.

APPLICANT SIGNATURE PROPERTY OWNER (S) SIGNATURE

FOR STAFF USE

VARIANCE: Zoning Code ( ) Sign Code ( ) Landscape Ordinance ( ) Other ( )

APPEAL: Zoning Code ( ) Sign Code (X) Landscape Ordinance ( ) Other ( )

Section(s) H.1/H.3/B Zone N/A

Date Fee Paid: 9-10-98

COMMENTS:

How does the variance request protect the public health and general welfare?

THE SIGN IN QUESTION IS NOT IN RESIDENTIAL AREA. THE THEATRE IS BOUNDED BY A SHOPPING CTR. ON NORTH EAST, TELSHOR BLVD. ON SOUTHEAST, US 70 ON NORTHWEST & VACANT SITE ON SOUTHWEST SIDE. THE SIGN ONLY SERVES PATRONS INTERESTED IN MOVIE SELECTION & TIMES AND DOES NOT EFFECT NEIGHBORING BUSINESS OR TRAFFIC.

How does the variance request encourage the conservation of energy in the use of structures, buildings, and land in the City?

DOES NOT APPLY

2. **Explain why granting the variance would not merely serve as a convenience, but would be considered the minimum necessary for relief due to some demonstrable hardship, and where reasonable alternative means are not available.**

(SEE ATTACHED) EXHIBIT "E"

3. Explain how the variance request does not adversely affect adjoining properties.

THE THEATRE IS BOUNDED BY A SHOPPING CTR. ON THE NORTHEAST, TELSHOR BLVD. ON SOUTHEAST, U.S. 70 ON NORTHWEST, & VACANT SITE ON SOUTHWEST SIDE. THE SIGN IN QUESTION IS VISABLE AND LEGIBLE FROM A MAXIMUM DISTANCE OF 150 FEET FROM THE SIGN. (SEE ATTACHED GRAPH FROM SEVENTH EDITION OF RAMSEY/SLEEPER - ARCHITECTURAL GRAPHIC STANDARDS.)

4. Explain how the variance request will not diminish or impair established property values.

THE SIGN IN QUESTION IS DESIGNED AS PART OF THE BUILDING'S CANOPY/MARQUEE SIGNAGE AND IS AN INTEGRAL PART OF THE OVERALL BUILDING'S DESIGN. THIS SIGN AS WELL AS THE THEATRE BUILDING SIGN WAS INCLUDED AS THE TOTAL ALLOWABLE SIGN SQ. FOOTAGE OF 1½ S.F. PER LINEAR FOOT OF EXTERIOR WALL. ACTUAL LINER FEET OF SOUTHEAST WALL IS 269.0'X1.5 S.F. = 403.5 SQ. FT.

ACTUAL SQ. FT. OF SIGN IS 32 FT. + 141 FT = 173 SQ. FT.

BOARD OF ADJUSTMENT
JUSTIFICATION STATEMENT

Please respond to the following statements as reasons to the Board of Adjustment in justifying the variance request. Additional sheets of paper may be included. (SEE EXHIBIT "E")

1. Explain how your variance request complies with the City's zoning laws through the following questions.

   How does the variance request prevent congestion in the streets and other public rights-of-way?

   THE SIGN IN QUESTION IS 4'x8' WITH SIX (6) LINES OF 3" HIGH TEXT. THE SIGN WAS INTENDED TO BE READ BY THE PUBLIC FROM CLOSE PROXIMITY WITHIN THE PARKING LOT DRIVE. THE SIGN IS 510 FEET FROM NEAREST PUBLIC RIGHT-OF-WAY, TELSHOR BOULEVARD.

   How does the variance request secure safety from fire, panic, and other dangers?

   THE SIGNS LOCATION AND USE DOES NOT IMPACT THE ABOVE. IT IS NOT A HAZARD TO VEHICULAR TRAFFIC ON ANY PUBLIC RIGHT-OF-WAY.

   How does the variance request assure adequate light and air for all properties?

   DOES NOT APPLY

   How does the variance request prevent the overcrowding of land and undue concentration of population?

   NOT APPLICABLE

   How does the variance request facilitate adequate provisions for transportation, water, sewer, schools, parks, other public facilities and reduce the effect of natural hazards?

   NOT APPLICABLE

   How does the variance request control and abate the unlawful use of structures, buildings, or land?

   NOT APPLICABLE

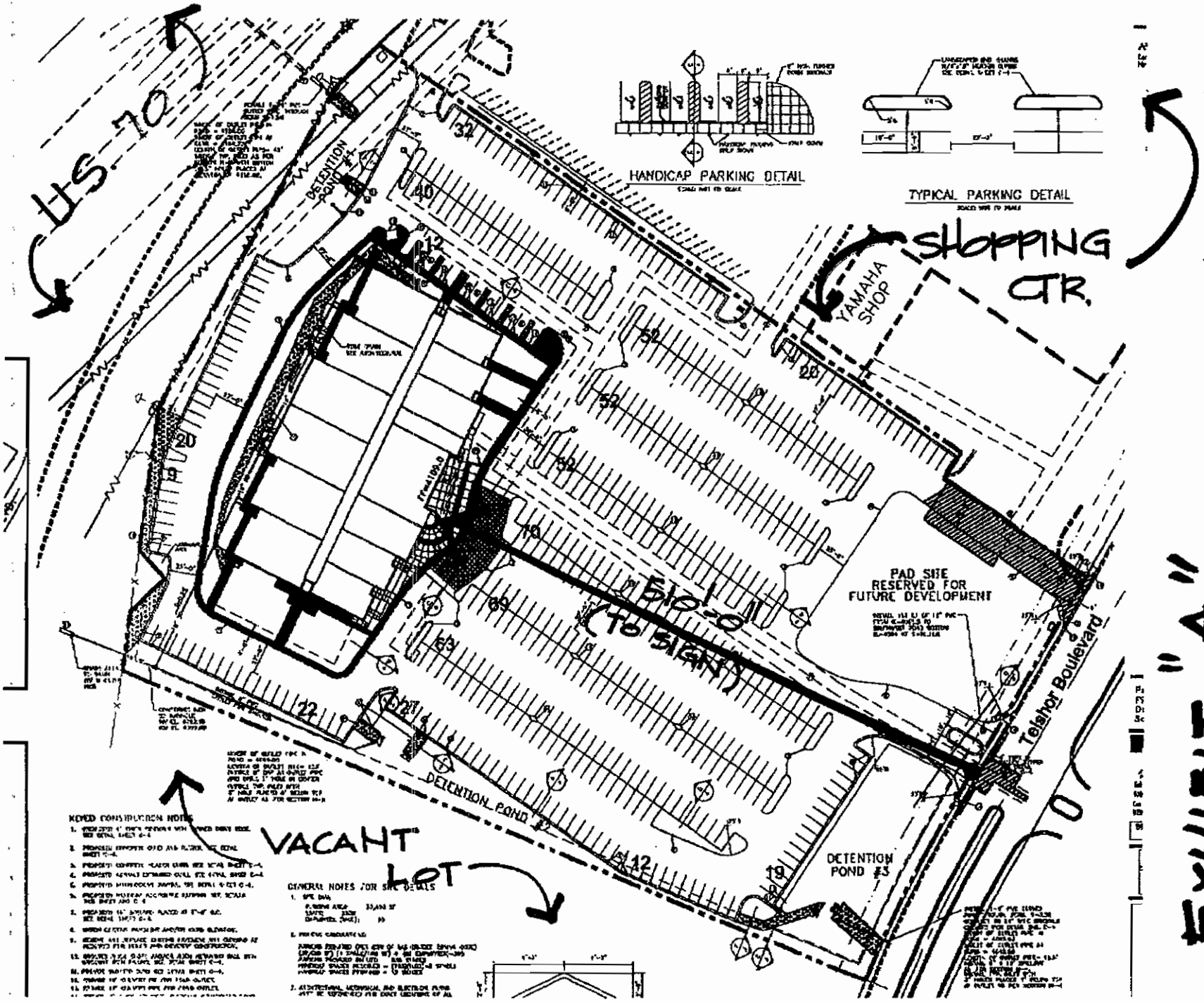

US 70
DETENTION POND #1
HANDICAP PARKING DETAIL
TYPICAL PARKING DETAIL
SHOPPING CTR.
YAMAHA SHOP
PAD SITE RESERVED FOR FUTURE DEVELOPMENT
Telshor Boulevard
DETENTION POND #2
DETENTION POND #3
VACANT LOT
KEYED CONSTRUCTION NOTES
GENERAL NOTES FOR SITE DETAILS

EXHIBIT "A"

HICULAR CONSIDERATIONS

re are strong differences between the perceptual formance of the driver and that of the pedestrian. reasing speed imposes five limitations on man:

MAN'S CONCENTRATION INCREASES: While stationary or walking, a person's attention may be widely dispersed. When moving in an automobile, however, he or she concentrates on those factors that are relevant to the driving experience.

THE POINT OF CONCENTRATION RECEDES: As speed or motion increases, a person's concentration is directed at a focal point increasingly farther away.

PERIPHERAL VISION DIMINISHES: As the eye concentrates on detail at a point of focus a great distance ahead, the angular field of vision shrinks. This shrinking process is a function of focusing distance, angle of vision, and distance of foreground detail.

FOREGROUND DETAIL FADES INCREASINGLY: While concentrating on more significant distant objects, a person perceives foreground objects to be moving and increasingly blurred.

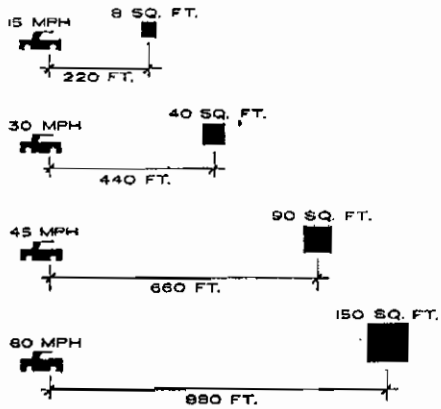
SPACE PERCEPTION BECOMES IMPAIRED: As the time available for perceiving objects decreases, specific details become less noticeable, making spatial perception more difficult.

th an increasing rate of motion, it becomes more d more important that copy, including illustrations d symbols, be created specifically for out-of-doors e and not merely rescaled from other media of communication. The safety of the motorist and passengers n depend on the clarity of messages conveyed by ns.

VEHICLE SPEEDS VERSUS LETTER HEIGHT ON TRAFFIC SIGNS

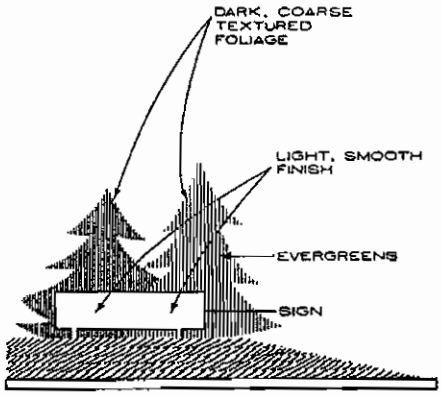
INITIAL SPEED	DISTANCE TRAVELED WHILE READING	DISTANCE TRAVELED WHILE SLOWING	TOTAL DISTANCE	SIZE OF COPY AT 65 FT/IN.
30 mph	110 ft	200 ft	310 ft	4.8 in.
40 mph	147 ft	307 ft	454 ft	7.0 in.
50 mph	183 ft	360 ft	543 ft	8.4 in.
60 mph	220 ft	390 ft	610 ft	9.4 in.

NOTE: It is recommended that street name signs have 4 in. letters in area where vehicle speeds are 30-35 mph. For speeds of 40 mph and over, a 5 in. letter size is recommended.

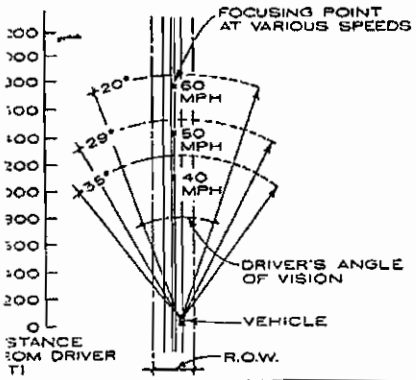


SPEED, SIGHT DISTANCE AND GRAPHIC SIZE RELATION SHIPS

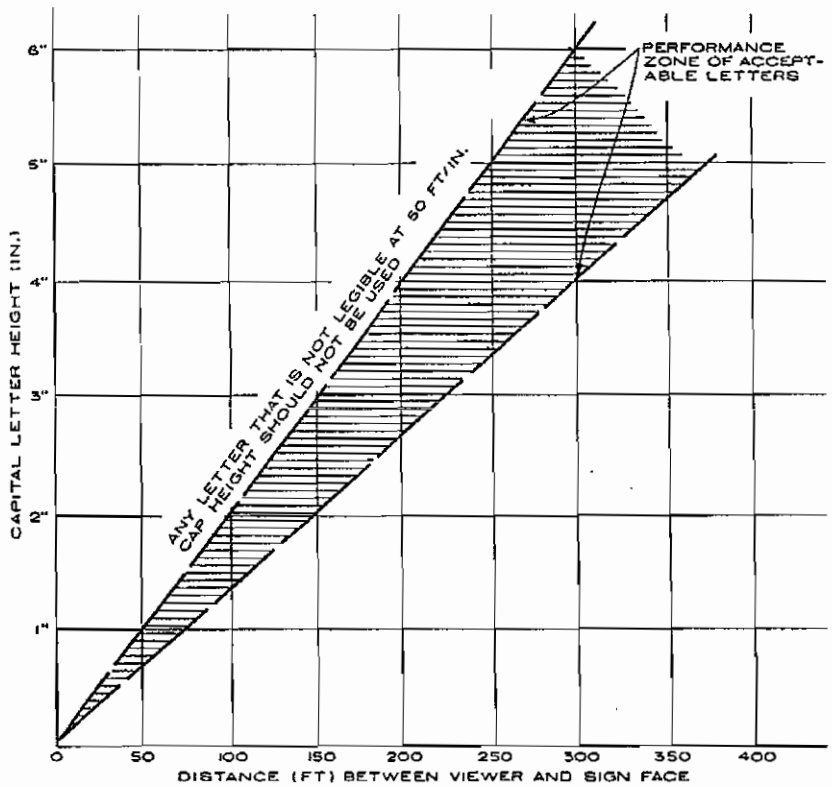
NOTE: LETTERS SHOULD CONSTITUTE APPROXIMATELY 40% OF GRAPHIC'S AREA.

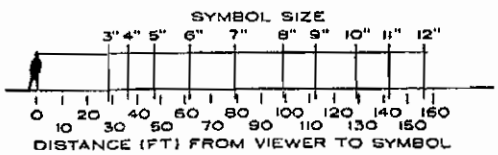


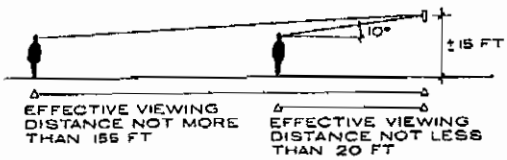
CONSIDER BACKGROUND WHEN CHOOSING COLOR AND MATERIALS



ELATIONSHIP BETWEEN DRIVER'S OCUSING POINT AND ANGLE OF ISION DOES NOT CONSIDER EFFECT F PRECEDING TRAFFIC







EDESTRIAN CONSIDERATIONS

NOTE

Under normal daylight conditions, with normal vision, and an angular distortion of 0° approximately 50 ft/in. of capital height can be taken as a guideline for minimal legibility, as seen from the chart.

ohnson, Johnson & Roy; Ann Arbor, Michigan

EXHIBIT "B"

919

SITE IMPROVEMENTS 2

Las Cruces
Farmington
Clovis
Hobbs
Roswell

ALLEN THEATRES

Portales
Gallup
Alamogordo
Carlsbad
Cortez, CO

August 20, 1998

To Members of the Board of Adjustment
City of Las Cruces

In Re: Application for Variance+Telshor 12 Theatre

For your consideration, I would like to describe for you the LED Information Board located above the entrance to the lobby of the new Telshor 12 Cinema.

The Board is approximately 4'x8'. It displays 6 lines of 3" letters.

Each page of information is displayed for approximately 20 seconds and the intensity of the illumination does not change. There is no "flashing" light.

The Information Board was installed as a courtesy to our customers and our customers only. It is connected to our computerized ticking system and gives our customers detailed information about prices, show times and available seating.

The Board does not face any street or thorough fare. The Board can be seen only by persons who are close to the Theatre building.

Because of the true purpose and location of the Board, we ask for a variance so the we may be able to continue to serve our customers in the way they deserve to be served.

Sincerely,

Russell Allen
General Manager
Allen Theatres Inc.

EXHIBIT "C"

P.O. Drawer 1500 · Farmington, NM 87499 · (505) 325-9313 · FAX (505) 326-2647

MOY SURVEYING, INC.
414 N. DOWNTOWN MALL, LAS CRUCES, N.M. 88001
PHONE: (505) 525-9683 - FAX: (505) 524-3238

JULY 6, 1998

DESCRIPTION OF A 0.302 ACRE UTILITY EASEMENT

An easement situate within the City of Las Cruces, in Parcel 1A, Coogan-Greer Subdivision No. 2, Replat No. 1, filed July 29, 1992, in Book 17, Pages 214-215, Dona Ana County records and being more particularly described as follows, to wit:

Beginning at the most Northwesterly corner of the easement herein described; whence the Northwest corner of Parcel 1A, Coogan-Greer Subdivision No. 2, Replat No. 1 bears N.55°45'00"W., 400.45 feet;

Thence from the point of beginning, S.55°45'00"E., 10.00 feet to a corner of this easement;

Thence S.33°55'09"W., 38.27 feet to a corner of this easement;

Thence N.56°04'51"W., 104.54 feet to a corner of this easement;

Thence S.34°15'00"W., 181.12 feet to a corner of this easement;

Thence S.55°45'00"E., 300.13 feet to a corner of this easement;

Thence N.34°15'00"E., 23.02 feet to a corner of this easement;

Thence S.55°45'00"E., 10.00 feet to a corner of this easement;

Thence S.34°15'00"W., 23.02 feet to a corner of this easement;

Thence S.55°45'00"E., 18.66 feet to a corner of this easement;

Thence S.59°48'28"E., 138.81 feet to a point on the North line of Telshor Boulevard for a corner of this easement;

Thence along the North line of Telshor Boulevard, S.30°11'30"W., 10.00 feet to a corner of this easement;

Thence leaving the North line of Telshor Boulevard, N.59°48'28"W., 139.16 feet to an angle point of this easement;

Thence N.55°45'00"W., 329,14 feet to

Post-it® Fax Note 7671	Date 9/9/98	# of pages ▶ 1
To JOHN McCONNELL	From Kelly DAVIS	
Co./Dept. PARTNERS IN AREA	Co. B-L	
Phone # 214-340-1274	Phone # 505-823-1000	
Fax # 214-340-1729	Fax #	

EXHIBIT "D"

PA

September 9, 1998

To Members of the Board of Adjustment
City of Las Cruces

Exhibit "E"

Re: Telshor Cinemas, Allen Theatres
Las Cruces, NM

This request for a "Staff Interpretation Appeal" is in response to a letter from Lisa Mizrahi, dated July 24, 1998, informing Allen Theatres, Inc., that the Reader Board on the southwest corner of the building's canopy/marquee, is not in compliance with the Sign Code (Section H.3 and B) and (Section I.6)

(Prohibited Signs) Section H.3 Reads as follows: *A flashing, rotating or animated sign, or a sign with intermittent or varying intensity of illumination, whether deliberate or resulting from a defect in the sign or light source.*

As noted in the letter from Allen Theatres, Inc., the text is three inches high and the information displayed is displayed for approximately 20 seconds and the intensity of the illumination does not change. The information displayed, show time, available seating and ticket cost is pertinent to the patrons only.

The sign in question was designed as a part of the overall building canopy/marquee sign and was included in the total allowable area for an attached signage. Because this sign was pertinent to the type of business ie. (Cinemas), it is in our opinion as "Accessory use sign", which as noted in G.1- Signs not Requiring Permits, does not require a permit.

Item 2. Explain why granting the variance would not merely serve as a convenience, but would be considered the minimum necessary for relief due to some demonstrable hardship, and where reasonable alternative means are not available.

The Traditional means of displaying and advertising movies on a multi-screen theater building was with large marquees signs with dimensions of 8 feet high and 20 feet long using 8" high letters that could be readable from a passing car on the street. There would have to be two such signs attached to the canopy of this size to accommodate twelve screens. Because of the way the Telshor Cinemas Theater was sited, there was no reason to have such a display. The smaller sign integrated into the building canopy/marquee was considered to be more efficient in information dispersed, aesthetically pleasing and applicable to the specific patrons desiring the information of show times and ticket cost. The building canopy was not structurally designed to go back and accommodate neither weight nor appearance of the larger traditional marquee signs.

Thank you for your time and consideration in this matter.

Sincerely,

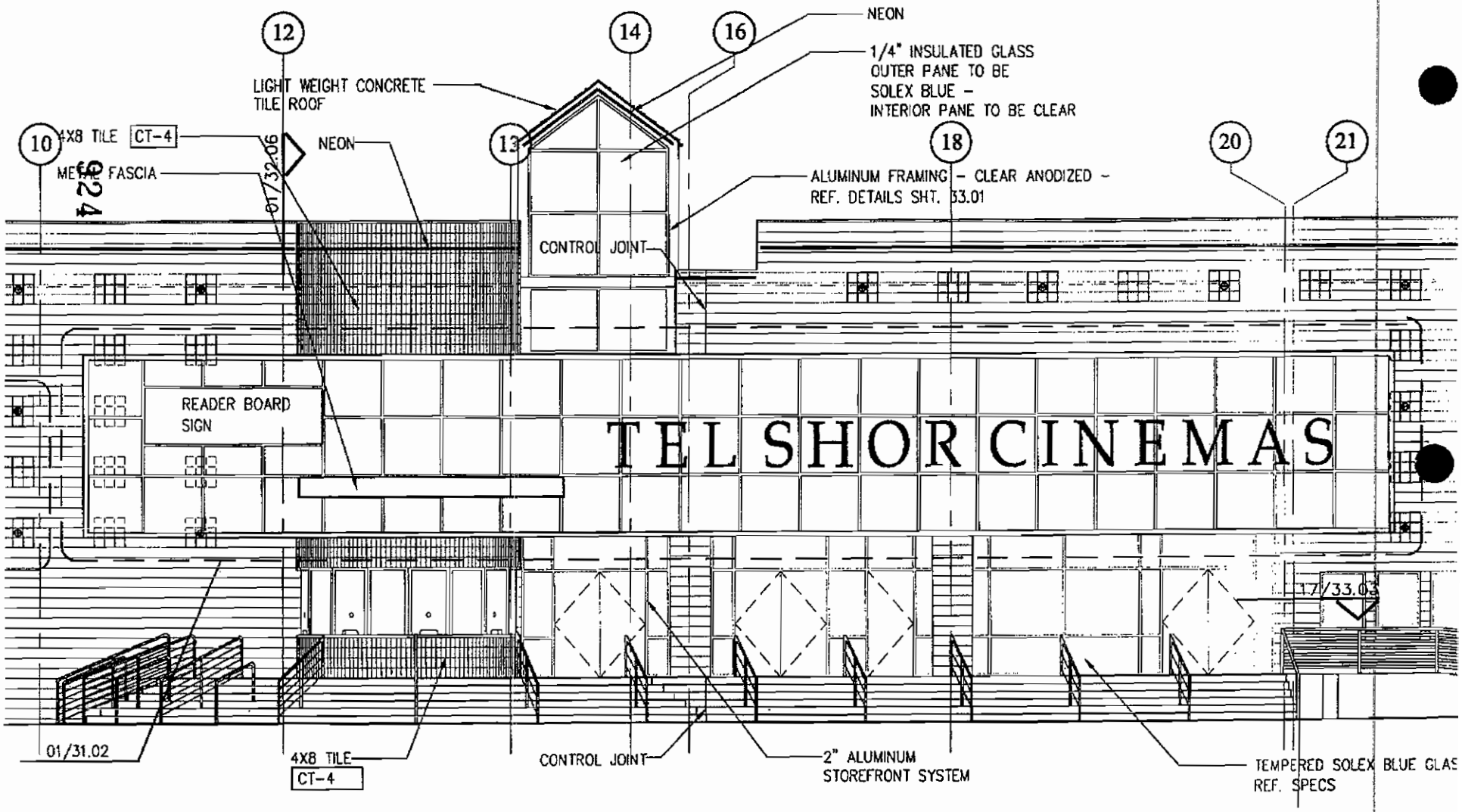
John McConnell

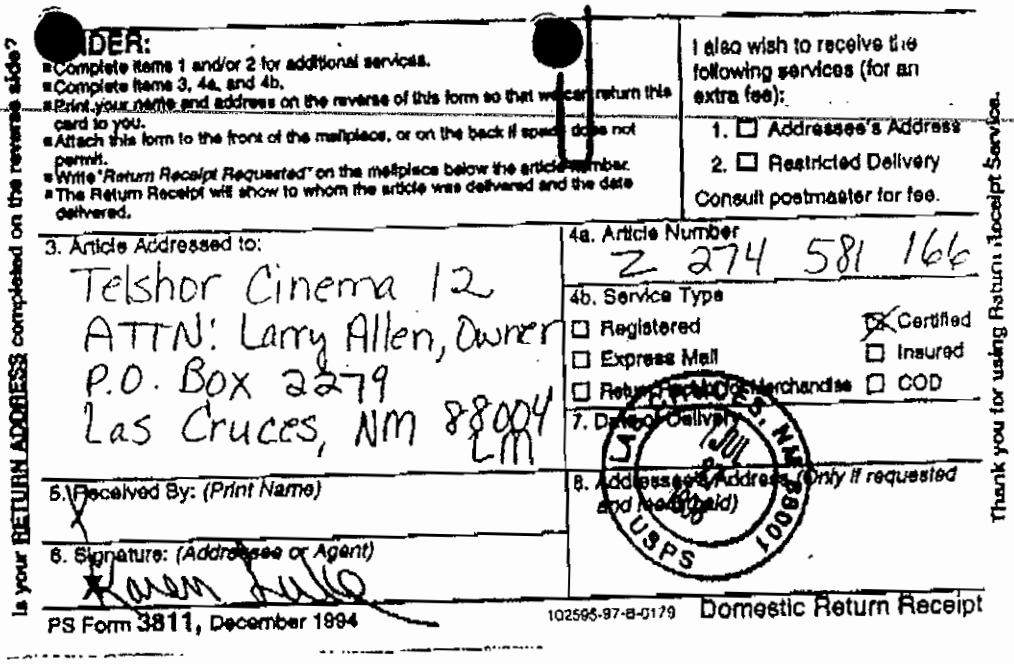
John McConnell, AIA
Project Architect

090998LI-Board of Adjustment

PARTNERS IN ARCHITECTURE
9603 WHITE ROCK TR.,STE.220
DALLAS, TEXAS 75238
214 340 1274 214 340 1729 fax

EXHIBIT "F"


12
14
16
NEON
1/4" INSULATED GLASS
OUTER PANE TO BE
SOLEX BLUE -
INTERIOR PANE TO BE CLEAR
LIGHT WEIGHT CONCRETE
TILE ROOF
10
4X8 TILE
CT-4
NEON
13
18
20
21
METAL FASCIA
01/32.06
ALUMINUM FRAMING - CLEAR ANODIZED -
REF. DETAILS SHT. 33.01
CONTROL JOINT
READER BOARD
SIGN
TELSHOR CINEMAS
01/31.02
4X8 TILE
CT-4
CONTROL JOINT
2" ALUMINUM
STOREFRONT SYSTEM
TEMPERED SOLEX BLUE GLAS
REF. SPECS


SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Telshor Cinema 12
ATTN: Larry Allen, Owner
P.O. Box 2279
Las Cruces, NM 88004
LM

4a. Article Number
Z 274 581 166

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery

5. Received By: (Print Name)

8. Addressee's Address (Only if requested and fee paid)

6. Signature: (Addressee or Agent)

PS Form 3811, December 1994 102595-97-B-0179 Domestic Return Receipt

Is your RETURN ADDRESS completed on the reverse side?

Thank you for using Return Receipt Service.

Call #0762108

July 24, 1998

Telshor Cinema 12
ATTN: Larry Allen, Owner
P.O. Box 2279
Las Cruces, NM 88004

RE: 2811 N. TELSHOR BLVD.

Dear Mr. Allen:

All permanent and temporary signs and/or banners require a sign permit (Section 1.6a, Sign Code). Signs and banners must comply with various size, height, and placement requirements.

The attached sign affixed to the southwest corner of the building near the ticket office that advertises the names and times of feature movies is in violation of the Las Cruces Sign Code for the following:

a. No sign permit was obtained for this particular sign (Section I.6, Sign Code).
b. This sign is considered to be flashing, spectacular, automatically changing advertising, and contains intermittent and varying intensity of illumination, which are not permissible under the Sign Code (Section H.3 and B).

Options in correcting the existing violations are as follows:

a. Remove the sign.
b. Adjust the programming of the sign so that it NEVER changes advertising messages or changes light intensity, and obtain a sign permit.
c. Relocate the sign to the inside of the building - not attached to the window or windowsill.

At this time it is requested you bring your signage into compliance within **thirty (30) days** after receipt of this certified letter.

Sign permits and additional information may be obtained from the Sign Administrator, Lani Ruth, at the Planning Department, 575 S. Alameda, telephone number 528-3222.

If you have any questions, please contact me at 528-4100 between the hours of 8:00 a.m. and 5:00 p.m., Tuesday through Friday.

Sincerely,

Lisa Mizrahi

Lisa Mizrahi
Codes Officer
CODES ENFORCEMENT DEPARTMENT

dgc

PHONE CALL

FOR Lisa DATE 8-6 TIME 1556 A.M. P.M.
M John McConnell
OF Partners in Architecture
PHONE (214) 340-1274
AREA CODE NUMBER EXTENSION
FAX#
MESSAGE Letter on Allen

X	TELEPHONED
	RETURNED YOUR CALL
X	PLEASE CALL
	WILL CALL AGAIN
	CAME TO SEE YOU
	WANTS TO SEE YOU

Page 65

1 were aware of seven-foot setbacks and things like
2 that?
3 MR. JENSEN: That's what the house is
4 on the side.
5 MR. GUTIERREZ: Yes. You weren't
6 aware you needed a permit to construct the
7 building? That seems inconsistent.
8 MR. JENSEN: It's just a shed.
9 MR. GUTIERREZ: It's a pretty
10 substantial shed. It's on concrete, and it's got
11 siding. This isn't a metal building. I guess I was
12 wondering, I know the power line's got three phases
13 that run right down there along the side there, and
14 I'm aware of these things in Country Club Estates.
15 What I was asking you, you seem to be aware of
16 setbacks but not that you would need a building
17 permit.
18 MR. JENSEN: I'm aware my home is
19 seven foot from the side, and I'm aware there's a
20 10-foot easement on the back that I got a five-foot
21 relief on. See, the building sits five foot from
22 the back line. The original plat of survey was a
23 10-foot easement. I've gotten five-foot relief from
24 El Paso Electric and U.S. West and the TV Cable,
25 which I provided a copy of that easement relief to

Page 66

1 the City.
2 CHAIR BROWN: Any other questions fom
3 the Board?
4 Is there anybody in the audience to address this
5 case?
6 Anybody else care to speak on this case?
7 Do you have anything further?
8 MR. JENSEN: No, sir, I guess that's
9 it.
10 CHAIR BROWN: All right, thank you.
11 Staff, were there any comments on this case?
12 MS. RUTH: No, I don't have anything.
13 CHAIR BROWN: Anything from the
14 planning department?
15 MS. RUTH: No, sir.
16 CHAIR BROWN: Okay, thank you. If
17 there is nothing further from the Board, then I
18 would entertain a motion.
19 MR. HENNIGH: So moved.
20 MS. MCCLENDON: Second.
21 CHAIR BROWN: Everybody remember to
22 speak up, because we have to keep recording these
23 things.
24 Okay, Case A1379. Any further discussion?
25 We'll take a roll call vote. Mr. Cole?

Page 67

1 MR. COLE: I vote no. I'm
2 sympathetic to the applicant's position because he
3 sees other buildings not in compliance, but I think
4 at some point we have to recognize this and perhaps
5 remind codes enforcement that they have to go out
6 and take action against the other buildings that
7 have been built improperly.
8 MS. MCCLENDON: I vote no for the
9 same reason.
10 MR. HENNIGH: I vote no. I think
11 it's a nice structure and everything, and I'm sorry,
12 but too often we have to do this once a building has
13 been put in place and then we're asked to approve
14 it.
15 MR. SANCHEZ: I vote no. Same
16 reason.
17 MR. GUTIERREZ: I vote no for the
18 same reasons.
19 CHAIR BROWN: I vote no for the same
20 reasons. And in addition, I have not seen a
21 hardship demonstrated. And the process needed to be
22 adhered to as well as the setback.
23 Case A1379 is unanimously voted no. You can get
24 with staff on appeal. Thank you, sir.
25 Case A1380, request to appeal/overturn a staff

Page 68

1 interpretation that considers an LED information
2 Board a spectacular sign. Spectacular Signs are
3 prohibited under Section B,H.1 and H.3 of the Las
4 Cruces Sign Code, Article XIII of the 1981 Las
5 Cruces Zoning Code, as amended. Submitted by Allen
6 Theaters.
7 MS. RUTH: Chairman Brown, Board
8 Members, basically, staff has interpreted the Sign
9 Code to say the LED information sign displayed at
10 the Telshor 12 Cinemas is a spectacular sign,
11 primarily because it automatically changes
12 advertising.
13 The definition of spectacular sign does exist in
14 the Sign Code, but nowhere else in the Sign Code is
15 spectacular sign mentioned.
16 Section 8.1 of the Sign Code states that any
17 sign not expressly permitted throughout the document
18 is prohibited. Other than that, I can answer any
19 questions, but that's staff's primary position on
20 the sign.
21 CHAIR BROWN: Thank you. Any
22 questions of staff from the Board?
23 Is somebody in the audience to represent this
24 case? Please step to the microphone, sir, and state
25 your name.

Page 69

1 MR. ALLEN: Russell Allen, Allen
2 Theaters. We question the fact of whether or not
3 this--what the true purpose of a spectacular sign
4 is. We believe that that particular part of the
5 enforcement code was to not divert driver's atention
6 from their driving so that it would cause
7 accidents. That it's there for advertising purposes
8 to get someone's attention to what they're doing.
9 This particular sign is 500 or so feet away from
10 the nearest thoroughfare, which is Telshor, and the
11 only people that can read this sign are the people
12 whose destination is the theater. And therefore, we
13 disagree with the definition of the sign and ask for
14 a variance on this.
15 CHAIR BROWN: Thank you. Any
16 questions from the Board?
17 MR. COLE: Given the distance from
18 the road and the fact that the sign essentially is
19 not readable from the road--am I correct?
20 MR. ALLEN: Yes.
21 MR. COLE: --the only people that are
22 going to read it are those already in your parking
23 lot presumably coming to see a movie.
24 MR. ALLEN: Correct.
25 MR. COLE: Why do they need the

Page 70

1 sign? Don't most of them know what movie they want
2 to see and what time it goes on?
3 MR. ALLEN: That's correct. The sign
4 is hooked up to our computer and ticketing system,
5 and it lists the movie, the show time, and also if
6 there are seats available. If the computer system
7 gets down to where it's a sold-out system, that time
8 that they're going to go to will switch from "sold"
9 to "7:25." "Sold. 7:25. Sold."
10 MR. COLE: "Sold" would be the 5:00
11 performance?
12 MR. ALLEN: That particular
13 performance is sold out. Therefore, those people
14 that head to that destination, heading to the
15 theater, have a little more information. Maybe they
16 can take the second option. Having 12 different
17 screens, we give that opportunity to those
18 customers, that if the one they are going to is sold
19 out, that they will have a second option. And
20 therefore, from the newspaper advertising or
21 whatever, they have that information available to
22 them.
23 We're not trying to sell them the movie. We are
24 under the impression that once they drive onto the
25 property that that's kind of what they're there for,

Page 71

1 and we want to give them the most up-to-date
2 information that we can give them.
3 MR. COLE: May I?
4 CHAIR BROWN: Yes, go ahead.
5 MR. COLE: With what frequency, if
6 any, would you expect somebody's coming in to see
7 the 5:00 performance of Gone With the Wind, and your
8 sign says it's sold out--would you expect those
9 people to leave and come back at another time as
10 opposed to staying and seeing another movie?
11 MR. ALLEN: We're hoping quite
12 often. We are hoping quite often, and we do believe
13 that that is the case. That once you've blocked off
14 that hour of time to go to the movie, if your first
15 choice is sold out, that, Well, we've got two hours;
16 we've already had dinner; we might as well stay and
17 do that.
18 So we don't feel that there is a lot of drive
19 through. If they drive through once, and they see
20 what's happening, they've evaluated what their
21 second choice may be. If it's four or five minutes
22 later, they may leave and come back and go that.
23 CHAIR BROWN: Mr. Gutierrez.
24 MR. GUTIERREZ: Staff, the intent of
25 the spectacular ordinance is an issue that was

Page 72

1 raised--
2 MS. RUTH: Chairman Brown, Board
3 Member Gutierrez, the intent of the spectacular sign
4 prohibition was to eliminate, I guess, the gaudiness
5 or the Las Vegas style signs in Las Cruces. While
6 this particular sign, being 32 square feet, 500-plus
7 feet from the right-of-way may not be such an issue,
8 keep in mind that the spectacular sign prohibition
9 applies to all properties in Las Cruces. And the
10 sign could be larger, could be closer to the
11 right-of-way, could be on billboards, could be, you
12 know, pretty much anywhere.
13 The spectacular sign not only applies to this
14 type of sign, but other signs that rotate or draw
15 attention from the road, cause safety problems, etc.
16 I don't know if that answers your question.
17 MR. GUTIERREZ: Yes, it does.
18 Second thing, there wasn't a permit issued. It
19 was an understanding that it was an accessory versus
20 a spectacular sign?
21 MS. RUTH: Yes. Actually, I was
22 doing some research on the file, and it appears a
23 marquee sign permit was issued for the sign. I
24 issued the permit thinking "marquee" meant taking
25 the letters on and off. I didn't really know it was

Page 73

1 this type of sign, so a permit was issued for a
2 sign, not this particular sign.
3 MR. GUTIERREZ: Lastly, I guess the
4 problem I'm mulling over is the overall
5 ramifications. What you have up there now is not
6 obtrusive. I mean, you can't see it that closely.
7 But I think Lani's brought up a good point, and that
8 is, if we do this, what have we got? Any building
9 anywhere that wanted to do that, then it would be
10 hard to say no. You know, if somebody else wanted
11 to put up a marquee, say, at one of the other--not a
12 marquee, a spectacular sign. Not only a theater,
13 but any other business. That's where I'm having the
14 problem. And going against that, I think the intent
15 of what they meant by spectacular, that's where I'm
16 having a problem right now.
17 MS. RUTH: Actually, Board Members,
18 if I could clarify, the vote that you'll be making
19 tonight isn't whether or not the Telshor 12 Cinema
20 can keep this sign. You'll be clarifying staff's
21 position regarding the interpretation.
22 In your packet, it talks about clarification on
23 the voting. If you vote yes, essentially, you're
24 overturning staff's position and agreeing with Allen
25 Theater that the sign is not prohibited in the Sign

Page 74

1 Code. And if you vote no on the case, you will be
2 upholding staff's position regarding the sign.
3 CHAIR BROWN: I have a question of
4 staff. What's going to happen to the sign no matter
5 how we vote?
6 MS. RUTH: Well, that's a big--if you
7 agree with staff's position, the sign will have to
8 be removed. There are a couple of alternatives.
9 The sign can actually stay as long as the
10 advertising doesn't change. If it's changing--I
11 believe we discussed this on the site tour--if it
12 changes on a weekly basis based on the movie
13 presentation, I don't have a problem with that.
14 It can be moved on the inside of the building
15 and keep doing what it's doing now, as long as it's
16 not attached to the window or the window sill.
17 Other than that, if they want to keep it doing
18 what it's doing, then they'll have to remove the
19 sign.
20 CHAIR BROWN: Thank you.
21 Mr. Allen, have you given any thought to putting
22 the sign inside the window?
23 MR. ALLEN: There is no possibility
24 of doing so.
25 CHAIR BROWN: Why is that?

Page 75

1 MR. ALLEN: We already have one
2 inside that's giving directions to what auditorium
3 to go to, plus there's no place to put it inside.
4 If you can imagine, it's the size of 4x8 sheet piece
5 of plywood, so it's, you know, a pretty good-sized
6 sign.
7 I want to note that it does not flash. It does
8 not change illumination. It rotates every 20
9 seconds. That doesn't qualify as flashing. And
10 again, it's not an advertising sign. It's an
11 information sign. We're not trying to draw anybody
12 to our business other than those that are already
13 showing up anyway. And our position is that we just
14 don't feel that it falls under this particular
15 spectacular definition.
16 CHAIR BROWN: My point about the
17 window was not so much the size of the sign, but the
18 information. It would seem that if it's appropriate
19 for customers to know that you have no seats
20 available that you would do that somehow, a "sold
21 out" sign or whatever. And whether that sign can be
22 reduced in size and be inside the building so it
23 doesn't fall into this category, that was my
24 question. And I thought that when I saw it. Thank
25 you, sir.

Page 76

1 Mr. Gutierrez.
2 MR. GUTIERREZ: Could the sign
3 flash? Could it change every five seconds or
4 whatever?
5 MR. ALLEN: Yes, it could.
6 MS. RUTH: It changes every 20
7 seconds right now.
8 MR. GUTIERREZ: If we were saying we
9 disagreed with staff's interpretation, could anybody
10 put up a sign, make it flashy or whatever?
11 MS. RUTH: The definition of
12 spectacular sign is all-encompassing, pretty much.
13 It says, "Any sign that oscillates, rotates,
14 flashes, varies in intensity or color, or
15 automatically changes advertising."
16 And I believe, as the sign administrator, that
17 the sign not only automatically changes advertising,
18 but in a way, it does flash, because the lights are
19 coming off and on.
20 MR. HENNIGH: Mr. Chairman, I was out
21 there the other night and watched it for probably
22 five to seven minutes, and it was information. It
23 was flashing, as the definition says, and I think
24 the problem is not so much the definition of a
25 spectacular--is that the word--does not apply to

Page 77

1 this type of a thing. Yes, it flashes. Yes, it
2 changes the information and does all of that under
3 computer control. But it is addressing it's message
4 to the people who are coming there because their
5 decision to spend their money has already been
6 made.
7 One thing I would say, you shouldn't flash it
8 every 20 seconds if you're going to put that much
9 information. One does not get ready to really
10 grasp--at least, I don't. But nonetheless, I may
11 have to vote that it is a spectacular, not because I
12 don't think you've got a good idea. I think the
13 definition needs to be reconsidered. But if indeed
14 we pass it and say that one is all right, then we
15 open Pandora's box for whatever spectacular someone
16 else can dream up in the future. Surely we can
17 write a better definition. Just comments.
18 CHAIR BROWN: Any other questions
19 from the Board?
20 Did you have anything further at this time, Mr.
21 Allen?
22 MR. ALLEN: The only thing, I don't
23 live here, but driving into town today I noticed the
24 sign over by the Pan Am Center. Why can that one
25 flash and not--

Page 78

1 MS. RUTH: That sign is outside the
2 city limits.
3 MR. GUTIERREZ: It's state property.
4 MS. RUTH: We don't have any control
5 over that sign.
6 CHAIR BROWN: Anybody in this
7 audience care to comment on this case? Thank you.
8 Do you have anything further?
9 MR. ALLEN: I don't believe so, no.
10 CHAIR BROWN: Okay, thank you, Mr.
11 Allen.
12 CHAIR BROWN: Any discussion among
13 the Board?
14 MR. SANCHEZ: I move for approval.
15 MS. MCCLENDON: Mr. Chair.
16 MS. RUTH: I would just like to add
17 when you guys are voting, maybe refer to the page in
18 your packet on what you're really voting. This is
19 kind of a backwards--if you vote yes, you're doing
20 something different than I think what yes normally
21 means. So just be cognizant of what you're doing,
22 please.
23 CHAIR BROWN: Ms. McClendon.
24 MS. MCCLENDON: I'm not going to be
25 voting on this case because Mr. Allen, Perry Allen,

Page 79

1 is a donator to our project.
2 CHAIR BROWN: There was another
3 comment, I think.
4 MR. SANCHEZ: Explain yourself,
5 Lani.
6 MS. RUTH: Voting yes on this case
7 will overturn staff's interpretation of the Sign
8 Code and will not only permit this sign, but will
9 permit any spectacular sign in Las Cruces. Voting
10 no on the case will uphold staff's position on the
11 interpretation and will not permit this sign or any
12 other spectacular signs in Las Cruces.
13 MR. GUTIERREZ: Second to the
14 motion. I don't think we had a second.
15 MR. COLE: Mr. Chairman I have a
16 request of Lani. I'm not clear as to why a yes vote
17 here will authorize all and any other kind of
18 spectacular, let's say a Las-Vegas-type sign going
19 up somewhere on Lohman Avenue. Why would that--why
20 would we have taken action that automatically
21 approves that and does not even require a variance
22 request?
23 MS. RUTH: Because the case before
24 you is an interpretation of the code. The point is,
25 do you agree with staff's position that this sign is

Page 80

1 spectacular because it changes advertising or
2 because it flashes? If you say no, someone can come
3 in with a permit for a similar type sign, bigger,
4 you know, larger, closer to the road, billboard,
5 whatever, and it would have to be permitted because
6 you've already stated that the Sign Code is
7 interpreted a specific way. And voting yes would do
8 so, because the request is to appeal or overturn
9 staff's interpretation.
10 MR. COLE: Thank you.
11 MR. HENNIGH: One more question, if I
12 could. What avenue would someone take to approach
13 the issue of the definition of a spectacular sign?
14 MS. RUTH: Chairman Brown, Board
15 Member Hennigh, anyone, at any point in time, can
16 submit an amendment to any one of our codes: Zoning
17 Codes, Design Standards, Sign Code. Anybody can
18 propose an amendment. We would take that amendment
19 and process it through the Planning and Zoning
20 Commission, the proper channels. And eventually, it
21 would end up at City Council for adoption or
22 amendment into whatever code they were proposing.
23 Staff can also do amendments to specific codes.
24 Being that you've obviously stated that you feel
25 there is a problem with the definition of

CITY OF LAS CRUCES
COUNCIL ACTION FORM

For Meeting of December 7, 1998
(date)

AGENDA ITEM TITLE:

A RESOLUTION REVERSING A DENIAL DECISION OF THE BOARD OF ADJUSTMENT ON AN APPEAL OF A STAFF INTERPRETATION REGARDING SPECTACULAR SIGNS. SUBMITTED BY LARRY RAMIREZ, ON BEHALF OF ALLEN THEATERS, INC. (CASE A1380).

BACKGROUND, SUPPORT INFORMATION, AND COUNCIL OPTIONS (in order):

This case is an appeal of a denial decision of the Board of Adjustment regarding an appeal of a staff interpretation. The case was a request to appeal/overturn a staff interpretation of the Las Cruces Sign Code that considers a LED Information Board (as displayed at the Telshor 12 Cinemas - 2811 North Telshor Boulevard) a spectacular sign, according to the Las Cruces Sign Code. Spectacular Signs are prohibited under Section H of the Las Cruces Sign Code (Article XIII of the 1981 Las Cruces Zoning Code, as amended). The case before the Board of Adjustment was made by Allen Theatres, Inc. and the appeal has been made by Larry Ramirez, legal counsel representing Allen Theatres, Inc.

Sometime in May, 1998 a sign was installed at the Telshor 12 Cinemas. The sign is 32 square feet and serves as a means of advertising to the cinemas' customers, displaying detailed information about prices, show times, and available seating. According to the applicants, the sign, through a lighted display system (called LED - light emitting diode), displays six lines of three inch letters. Each six lines of information is displayed for approximately 20 seconds and then automatically changes to the next six lines and a different message. The sign is attached to the building and is located near the entrance to the theater.

According to the Las Cruces Sign Code, the sign is prohibited because of its "spectacular" characteristics. The definition of a spectacular sign includes any sign which oscillates, rotates, flashes, varies in intensity or in color, or automatically changes advertising, or is animated or equipped with a glaring or rotating strobe light, or with spotlights. The sign displayed at the Cinemas is found to have a number of these characteristics.

(continue on additional sheets as required)

Name of Drafter:	Department/Division:	Phone:
Lani Ruth	Planning/Development Services	5 2 8 - 3222

STAFF COORDINATION

Division/Department	Signature	Phone	Division/Department	Signature	Phone
FIRE			ADMIN		
POLICE			LEGAL		
FINANCE			BUDGET		
UTILITIES					
COMM FACIL			ASST CITY MGR		
DEVEL SVCS		528 3300	CITY MANAGER		

Section H (Prohibited Signs) of the Sign Code refers to the characteristics of a spectacular sign as defined through Section H.3. While the citation does not specifically state "spectacular sign", it has been interpreted by staff and the Board of Adjustment that the prohibition is referring to a spectacular sign. Section H.3 reads as follows: a flashing, rotating, or animated sign, or a sign with intermittent or varying intensity of illumination, whether deliberate or resulting from a defect in the sign or light source.

The Board of Adjustment made a motion to approve the appeal of the staff interpretation. The motion failed by a vote of 0-5-1 (one member absent). The Board's primary justification in agreeing with staff's position regarding the spectacular sign was that the interpretation made by staff was appropriate, other options exist for the display of the same sign without coming under the purview of the Sign Code (such as relocating to the inside of the building), no hardship was demonstrated by the applicant, and fear that approval would allow the display of more grandiose spectacular signs throughout Las Cruces.

According to the appeal letter, the basis of this appeal rests on two primary arguments. First, the applicant states the intent of the ordinance was to prevent the "Las Vegas style" sign which is intended to be an attention getting device. The applicant further states that their sign is for informational purposes only and is not intended to draw business to the cinemas.

Secondly, the applicant argues that the sign displayed at the cinemas is an accessory use sign, and therefore requires no sign permit according to the Sign Code. Staff has responded to this by stating that the issue of sign type is irrelevant. When the Sign Code prohibits a "spectacular sign", it is making reference to a sign's operational characteristics. For clarification, the Sign Code does reference accessory use signs and defines them as a sign whose primary purpose is to identify the corporate/business entity and not advertise per se. Additionally, an accessory use sign must be incorporated into an object which serves a functional purpose such as a Coca-Cola machine or Wienerschnitzels' umbrellas. In terms of the sign used at the cinemas, the only purpose is advertising/communication.

Support Information:

1. Resolution
2. Appeal Letter
3. Board of Adjustment Information Packet for Case A1380
4. Unapproved Minutes from the October 13, 1998 Board of Adjustment Public Hearing

Options:

1. Vote "yes" and reverse the interpretive appeal decision made by the Board of Adjustment. This action would essentially permit the display of the sign in question and other signs having spectacular display characteristics throughout Las Cruces.
2. Vote "no" and deny the reversal of the interpretive appeal decision made by the Board of Adjustment. This action would uphold staff's and the Board of Adjustment's position of the interpretation and will not permit the sign in question, or any other displays of signs having spectacular display characteristics in the future.
3. Modify the Resolution. This action would require staff to amend the resolution based on Council direction. Direction may entail investigating an amendment or written clarification of the Sign Code regarding spectacular signs.

ATTACHMENT "D"

Ord. No. 2306 – 2006 Sign Code Amendment

COUNCIL BILL NO. 06-094
ORDINANCE NO. 2304

AN ORDINANCE AMENDING CHAPTER 36 OF THE LAS CRUCES MUNICIPAL CODE WHICH RELATES TO SIGNS. THE AMENDMENT PROPOSES SEVERAL UPDATES TO THE CODE INCLUDING: INCORPORATING ZONING DESIGNATIONS OF THE 2001 ZONING CODE, ELIMINATING THE PROHIBITION ON SPECTACULAR SIGNS, SPECIFYING THAT THE LAND OWNER SHALL BE CONTACTED ALONG WITH THE SIGN OWNER AND MODIFYING BILLBOARD REGULATIONS.

The City Council is informed that:

WHEREAS, Chapter 36 of the Las Cruces Municipal Code, addresses sign placement and design, and regulates the placement of all new signs including but not limited to real estate signs, on site monument and pole signs, wall signs, development identification signs, and billboards (off premise advertising of any size or shape) and

WHEREAS, the purpose of sign regulation is, in part, to preserve the natural beauty and environment of the City by preventing the over concentration, improper placement, and density of signs, and

WHEREAS, the sign code was adopted in 1990 and there are several areas that need to be updated including incorporating the zoning designations of the 2001 zoning code, eliminating the prohibition on spectacular signs, and specifying that the land owner shall be contacted along with the sign owner.

NOW, THEREFORE, Be it Ordained by the Governing Body of the City of Las Cruces:

(I)

THAT the amendments as shown on Exhibit "A," attached hereto and made part of this Ordinance, are hereby adopted.

(II)

THAT Chapter 36 of the Las Cruces Municipal Code is amended accordingly.

(III)

THAT City staff is hereby authorized to do all deeds necessary in the accomplishment of the herein above.

DONE AND APPROVED this 15 day of May, 2006.

APPROVED:

Mayor William Mattiace

ATTEST:

City Clerk

(SEAL)

VOTE:

Mayor Mattiace:	Nay
Councillor Frietze:	Nay
Councillor Connor:	Aye
Councillor Archuleta:	Aye
Councillor Trowbridge:	Aye
Councillor Jones:	Aye
Councillor Miyagishima:	Aye

Moved by: Archuleta

Seconded by: Connor

APPROVED AS TO FORM:

Asst City Attorney

Exhibit 'A'

Chapter 36

SIGNS*

* **Cross References:** Advertising, ch. 3; merchandising, advertising and signs in parks, § 20-37; streets and sidewalks, ch. 26; buildings and building regulations, ch. 30; development impact fee, ch. 33; subdivisions, ch. 37; zoning, ch. 38.

Article I. In General

Sec. 36-1. Purpose.
Sec. 36-2. Scope.
Sec. 36-3. Definitions.
Sec. 36-4. Calculation of sign area.
Sec. 36-5. Variances.
Sec. 36-6. Structural requirements.
Sec. 36-7. Maintenance and removal.
Sec. 36-8. Nonconforming signs.
Sec. 36-9. Permits.
Sec. 36-10. Prohibited signs.
Sec. 36-11. Placement.
Sec. 36-12. Lighting.
Sec. 36-13. Enforcement.
Secs. 36-14--36-40. Reserved.

Article II. On-Premises Signs

Sec. 36-41. General conditions.
Sec. 36-42. Residential zones REM, RE, EE, R-1aM, R-1bM, R-1cM, R-1a, R-1b, R-1c.
~~Sec. 36-43. Residential zones EE, UR, RA.~~
Sec. 36-434. Residential zones R-2, R-3, R-4.
Sec. 36-445. Flood Control, Open Space~~Agricultural~~ zones~~s~~ ~~A-1, A-2~~FC, OS-R, OS-NC.
Sec. 36-465. Office, neighborhood commercial zones O-1, O-2, C-1.
Sec. 36-467. General commercial zones C-2, C-3~~, C-4~~.
Sec. 36-487. Manufacturing zones MTech, M-1, ~~and~~ M-2, M-3.
Sec. 36-489. Business centers (various zones).
Sec. 36-~~50~~49. Sign regulations in overlay zone districts.
Secs. 36-501--36-80. Reserved.

Article III. Off-Premises Signs

Sec. 36-81. Attached signs.
Sec. 36-82. Public area signs.
Sec. 36-83. Billboards.
Sec. 36-84. Garage, private sale or event signs.
Sec. 36-85. Government signs.
Sec. 36-86. Political signs.
Sec. 36-87. Vehicle signs.
Sec. 36-88. Athletic field signs.
Sec. 36-89. Neighborhood signs.
Secs. 36-890--36-115. Reserved.

Article IV. Temporary Signs

Sec. 36-116. Construction/renovation signs.
Sec. 36-117. Real estate signs.
Sec. 36-118. Commercial promotional displays.
Sec. 36-119. Residential promotional displays.

Appendix 1. Development Standards

Appendix 2. Examples and Illustrations

ARTICLE I.

IN GENERAL

Sec. 36-1. Purpose.

The purpose of this chapter is to permit signs that will not, by their size, location, or construction, endanger the public health and safety of individuals or confuse, mislead, or obstruct the vision necessary for traffic safety. Furthermore, it is the purpose of this chapter to maintain property values and to create a more aesthetically pleasing community, through the preservation of the natural beauty and environment of the city, by preventing the over concentration, improper placement, and density of signs, but keeping in mind the importance of signage to the business community, and the vital element it is to the free enterprise system.
(Ord. No. 1128, § A.1, 5-18-90)

Sec. 36-2. Scope.

This chapter shall apply to all signs, as that term is defined in section 36-3, within the city limits.
(Ord. No. 1128, § A.2, 5-18-90)

Sec. 36-3. Definitions.

The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning (see appendix 2 for examples and illustrations):

Abandoned sign means an on- or off-premises sign that no longer directs, promotes, or advertises a bona fide business, lessee, owner, product, or activity conducted or product or service available on the premises where such sign is displayed.

Accessory use sign means any sign that is printed on or included in the design of any object which cannot be construed as being a building or freestanding sign.

Advertising means the action of calling something to the attention of the public by verbal or visual presentation.

Athletic field means a wide stretch of open land used for outdoor games such as baseball, football and soccer.

Attached sign means any sign which is fastened to, connected to, or painted on and wholly or partially supported by a building.

Awning means a hood or cover which projects from the wall of a building and is composed of rigid or nonrigid materials.

Awning sign means a sign which is fastened to or painted on an awning.

Banner means a sign composed of lightweight, flexible material on which letters, symbols or pictures are painted or printed.

Bench sign means any sign affixed to or painted on a functional bench.

Billboard means an off-premises sign directing attention to a business, activity, commodity, service, entertainment, or communication, none of which may be conducted, sold or offered on the premises where the billboard is located.

Bonus means an allowance for additional sign area as an incentive to reduce the legal height permitted, or to remove nonconforming signs.

Business/service center means a group of two or more businesses planned, constructed, owned and managed independently or as a total entity which share access, parking, or landscaping.

Canopy or marquee means a permanent roof-like shelter extending from part or all of a building or independent of a building.

Canopy sign means a sign attached to or painted on a canopy.

Clear sight triangle means a triangular area of unobstructed vision at street intersections and at curb cut entrances and exists.

Codes means any other applicable city, state or federal codes.

Collector street means a street which collects traffic from local streets and connects with major and minor arterials.

Construction/renovation sign means any temporary sign erected on the premises where construction/renovation is taking place and indicating the names of the architects, engineers, landscape architects, financial institutions, contractors or similar artisans, and the owners, sponsors, and similar individuals or firms having a role or interest with respect to the structure or project.

Copy means the verbal, visual or pictorial portion of any sign.

Corporate pertains to any organization incorporated pursuant to law.

Decorations means any display which calls attention to a community-organized event or to a state or national holiday.

Development identification sign means a permanent sign installed or constructed at the entrance/exit to a residential or commercial development to identify the development name and logo only.

Directional sign means any sign erected for the convenience of the public, such as the directing traffic movement, parking or identifying restrooms, public telephones, walkways and other similar features or facilities, and bearing no advertising message, excluding those erected by the United States Department of Transportation and the state highway and transportation department.

~~*Downtown area* means an area bounded by Picacho Avenue (north), Mesquite Street/Esperanza Street (east), Idaho Avenue (south) and El Paseo Road/Alameda Boulevard (west).~~

Flag/decorative means any rectangular display constructed of lightweight material having no logo or advertising message printed or painted on it.

Freestanding sign means any sign attached to or supported from the ground, and not attached to a building.

Garage sale sign. See *Private sale or event sign.*

Gate entrance sign means any sign installed or constructed over the entrance to the premises in specific zoning districts as described in this chapter.

Government sign means any sign erected by any city, county, state or federal agency or its designee, setting forth information pursuant to law.

Ground sign means any sign which is attached to either the ground or to a footing set flush with the ground.

House or building sign or nameplate means a sign limited to identifying the street name, building or property number, and the name of the owner or occupant of the building or property.

Illuminated sign means any sign which is lighted internally, externally or by lights directed towards the sign by any light source.

Information sign means any sign whose purpose is to indicate the business, hours of operation or similar identification information.

Legal notice means any sign required by law or pursuant to a court order.

Local street means a street designed to provide access to abutting property and local streets, and to discourage through traffic.

Logo means an identifying symbol used for advertising purposes.

Maintenance means the total upkeep of a sign, structurally and electrically, in terms of safety, and cosmetically, in terms of visual attractiveness.

Major arterial means a street with access control, channelized intersections, restrictive parking, and which distributes and collects traffic to and from minor arterials.

Marquee or canopy. See *Canopy.*

Marquee sign means a sign attached to, mounted on or painted on a marquee.

Minor arterial means a street with signals at important intersections and stop signs on side streets and which collects and distributes traffic to and from collector streets.

Model complex sign means any sign located on a complex site, limited in time until the complex ceases to be a model complex.

Mural means a picture or graphic illustration applied directly to a wall of a building or structure which does not advertise or promote a particular business, service or product.

National, state and corporate flags means any rectangular display constructed of lightweight material used to identify a nation, state or corporation.

Neighborhood Sign means a sign erected for the convenience of the public, directing traffic to and/or identifying specific neighborhoods and bearing no logo, tagline or advertising message.

Nonconforming sign means any sign legally erected and permitted in compliance with codes at the time it was erected and permitted, but which does not conform to cuerrenet codes or this chapter.

Off-premises sign means a sign which advertises or directs attention to a business, product, service or activity which is not available on the premises where the sign is located.

On-premises sign means a sign which advertises or directs attention to a business, product, service or activity which is available on the premises where the sign is located.

Pennant means a display made of a lightweight material which tapers to a point, having no logo or advertising message printed on it.

Point-of-sale sign means any sign which is located or attached directly to the product to be sold.

Pole sign means any sign whose primary means of support is one or more poles set into a concrete footing, located at or below ground level.

Political sign means a sign pertaining to any national, state or local election and/or caucus.

Portable sign means a freestanding sign not permanently affixed, anchored or secured to the ground or a building, which may be rolled or moved about.

Private sale or event sign means a temporary sign advertising private sales of personal property at garage, yard or estate sales and the like; private fundraising events, such as a nonprofit carwash, or food/clothing drive, etc.

Product identification sign means any sign used to identify the supplier/contractor of the construction product being used.

Prohibited sign means any sign not expressly permitted within this chapter, or any sign which is specifically prohibited in this chapter, as provided in section 36-10.

Promotional display, commercial means special advertising for grand openings, anniversaries, special or seasonal events, and which are for a limited time, in addition to the legal signage permitted.

Promotional display, residential means special advertising using pennants, flags, streamers, banners, open house signs and other similar signs, the duration of an open house or similar showing.

Public area means any bus bench, bus shelter, landscaped median, trail, park, or arroyo duly recognized by the city.

Real estate broker identification sign means a sign used at a broker's residence for identification purposes as prescribed by state law.

Real estate directional sign means a sign which advertises or directs attention to real property not available on the premises where the sign is located.

Real estate sign means a sign intended to advertise the financing, development, sale, transfer, lease, exchange or rent of real property.

Roof sign means any sign which is attached to the roof of a building or structure.

Setback means the distance required from the property line or from other buildings/structures or businesses.

Shopping center means a group of commercial establishments planned, constructed and managed as a total entity with customer and employee parking provided on site, provision for goods delivery separated from customer access, aesthetic considerations and protection from the elements.

Sign means any advertisement, announcement, direction or communication produced in whole or in part by the construction, erection, attachment or placing of a structure or object on any land, or on any other structure, or produced by painting on, posting or placing any printed, lettered, pictured, figured or colored material on any building, structure or surface.

Sign administrator means a city employee so designated to administer and enforce the terms and conditions of this chapter, the codes, and all other provisions of laws pertaining to signs.

Special use sign means any sign intended for use by establishments requiring a special use permit pursuant to chapter 38.

~~*Spectacular sign* means any sign which oscillates, rotates, flashes, varies in intensity or in color, or which automatically changes advertising, or which is animated or equipped with a glaring or rotating strobe light or with spotlights.~~

Streamers means a display made of light, flexible material, consisting of long, narrow, wavy strips having no logo or advertising message printed or painted on it.

Structural requirements means the safety standards that apply to those signs governed by the requirements in the ~~Uniform~~ Building Code and other companion documents.

Temperature/time/date sign means any sign with the purpose of displaying the temperature, time, date and logo/name.

Temporary sign means any sign intended for a limited period of display.

Total front footage means the total length of a property fronting on any side of a public street, or the total length of a building on which a sign is allowed.

Trademark/label/name means identification applied or attached to each permitted sign to designate the manufacturer and installer.

Unlawful sign means any sign ever erected which does not have a valid permit or, after erection, did not comply with all applicable provisions of the permit under which it

was constructed and erected, or did not comply with all provisions of codes, or which does or did not meet the necessary requirements to be considered nonconforming.

Unlicensed commercial sign means any sign erected by an individual, group, organization or club for fundraising or other monetary gain.

Unsafe sign means any sign identified by the sign administrator as being improperly constructed and installed, erected or secured, thereby subject to falling or creating a safety hazard, with supported findings.

Variance means an authorization granted to a property owner to depart from the numerical requirements of the zoning regulations (as applied here, this chapter).

Vehicle sign means a sign painted on or attached to either a vehicle or to a trailer designed to be pulled behind a motorized vehicle, which relates to a business, activity, use, service or product.

Wall sign means any sign affixed to or painted upon the wall of any building.

Window sign means any sign that is applied or attached to the exterior or interior of a window or a window frame.
(Ord. No. 1128, § B, 5-18-90; Ord. No. 1292, 12-21-92; Ord. No. 1526, 4-1-96; Ord. No. 2111, §§ I, II, 6-21-04; Ord. No. 2141, § I, 10-4-04)
Cross References: Definitions generally, § 1-2.

Sec. 36-4. Calculation of sign area.

(a) Sign size area is considered the area within the smallest rectangle or combination of rectangles which contains all advertising surfaces, background, framing and ornamentation, but not including sign supports or pole covers which contain nonsign copy.

(b) The area of an attached sign is measured as the area within the smallest rectangle or combination of rectangles which contains all text, symbols or other graphic elements, plus any background area which does not appear as a continuous portion of the building surface that highlights a sign.

(c) The area of a freestanding sign is measured by determining the sign area of all sides that are visible from any one vantage point, except only one side of a sign shall be measured if the two sides are back to back or separated by an angle of 45 degrees or less. If the two sides are not of equal size, the larger side shall be measured.
(Ord. No. 1128, § I.1, 5-18-90; Ord. No. 1292, 12-21-92; Ord. No. 1297, 2-2-93)

Sec. 36-5. Variances.

(a) There shall be no administrative variances issued for any section addressed in this chapter.

(b) Variance requests shall follow procedures and requirements outlined within chapter 38.
(Ord. No. 1128, § I.2, 5-18-90)

Sec. 36-6. Structural requirements.

(a) All signs shall conform to the structural design requirements set forth in the ~~Uniform~~International Building Code and companion documents.

(b) Sign permit applications for freestanding signs exceeding 20 feet in height, measured from ground level, shall be accompanied by an engineer's design drawing showing the appropriate calculations. The drawing shall be stamped by an engineer certified in the state.
(Ord. No. 1128, § I.3, 5-18-90)

Sec. 36-7. Maintenance and removal.

(a) *Damaged signs.* When any sign is substantially damaged, destroyed, taken down or removed for any purpose other than copy change or normal maintenance operation, it shall not be reerected, reconstructed or rebuilt except in full compliance with this chapter.

(b) *Unsafe signs.* If, in the opinion of the sign administrator, any sign becomes unsecured, unsafe or subject to fall, the sign administrator upon supported findings shall give written notice of the sign's condition to the person(s) responsible for the sign (the owner or lessee) and the land owner. The person so notified shall correct the unsafe condition of the sign within seven days in conformance with this chapter.

(c) *Maintenance.*

(1) All signs shall be kept in good repair, both structurally and in appearance. All braces, bolts, clips, fastenings and the supporting frame shall be securely affixed to the support structure or wall and shall be free from insect infestation, rot or other deterioration.

(2) If the message portion of a sign is not maintained or if it is removed, leaving only the supporting shell of a sign or the supporting braces, anchors or similar components, the owner of the sign or the owner of the property where the sign is located or other person having control over such sign shall, within 30 days of the removal of the message portion of the sign, either replace the entire message portion of the sign or remove the remaining components of the sign. This subsection shall not be construed to alter the prohibition on the replacement of a nonconforming sign, nor shall this subsection be construed to prevent the changing of the message of a sign.

(d) *Repair, alteration or removal.* Any written notice to repair, alter or to remove a sign will be sent via certified mail by the sign administrator to the land owner and to the sign owner~~,~~ -lessee, or person(s) responsible for the sign. If such order is not acted on within seven days, the sign administrator may initiate proceedings contained in this chapter to revoke the permit and remove the sign at the expense of the land owner, sign owner, lessee, or person(s) responsible for the sign.

(e) *Unlawful signs.* If any sign is installed, erected, constructed or maintained in violation of any of the terms of this chapter, or the applicable code the sign was erected under, the city may issue a written warning to the sign owner, lessee, property manager or landowner. This warning shall outline the violation and order the designated responsible party to bring the sign into compliance with this chapter and any other applicable codes within 14 days from the date of the warning. Only one warning per violation will be issued. The warning shall remain in effect for the duration of the business.
(Ord. No. 1128, § I.4, 5-18-90)

Sec. 36-8. Nonconforming signs.

(a) Subject to the remaining restrictions of this section, nonconforming signs that were otherwise lawful on the effective date of the ordinance from which this chapter derives may be continued.

(b) No person may engage in any activity that causes an increase in the extent of nonconformity of a nonconforming sign. Without limiting the generality of this statement, no nonconforming sign may be enlarged or altered in such a manner as to aggravate the nonconforming condition, nor may illumination be added to any nonconforming sign.

(c) Any change in the use of any building or property on which a nonconforming sign is located will require that all nonconforming signs on that property be brought into compliance with all applicable sections of this chapter within nine months of the change.

(d) ~~(d)~~ A nonconforming billboard may be reconstructed on the same property so as to meet the size, height, configuration, **and** support requirements of this code without losing its legal nonconforming status. To the extent possible, setback and separation requirements will be met. A sign permit is required in order to rebuild a nonconforming sign under this provision.

(e) A nonconforming on premise sign may not be moved or replaced except to bring the sign into ~~complete~~ conformity with this chapter to the extent possible. For the purpose of this subsection, the term "replaced" means the replacing of any or all parts of a sign that would extend the normal life span of the sign. An example is replacing wood pole supports with metal I-beam supports.

(~~f~~e) If a nonconforming sign is destroyed, damaged or in need of repair, it may not thereafter be repaired, reconstructed or replaced except in conformity with all the sections of this chapter, and the remnants of the former sign structure shall be cleared from the land. For purposes of this subsection, a nonconforming sign is destroyed, damaged or in need of repair if damaged up to 50 percent of the cost of repairing the sign to its former stature or if the cost of replacing it equals or exceeds the tax value (tax value if listed for tax purposes)/sign valuation (as stated on the original permit) of the sign so damaged, whichever is less.

(~~g~~f) The message of a nonconforming sign may be changed so long as this does not create any new nonconformities (for example, by creating an off-premises sign under circumstances where such a sign would not be allowed).

(~~g~~h) If a nonconforming sign other than a billboard advertises a business, service, commodity, accommodation, attraction or other enterprise or activity that is no longer operating or being offered or conducted, that sign shall be considered abandoned and shall be removed within 90 days after such abandonment by the sign owner, owner of the property where the sign is located or other party having control over such sign.

(~~h~~i) If a nonconforming billboard remains blank for a continuous period of 90 days, that billboard shall be deemed abandoned and shall be altered to comply with this chapter or be removed by the sign owner, owner of the property where the sign is located or other person having control over such sign. For purposes of this subsection, a sign is blank if:

(1) It advertises a business, service, commodity, accommodation, attraction or other enterprise or activity that is no longer operating or being offered or conducted;

(2) The advertising message it displays becomes illegible in whole or substantial part; or

(3) The advertising copy has been removed.

(~~i~~j) The city shall reserve the right to remove a nonconforming sign in accordance with state law.

(~~j~~k) This section shall not apply to any benches placed under the terms of any contract in effect on the date effective date of the ordinance from which this chapter derives.
(Ord. No. 1128, § I.5, 5-18-90; Ord. No. 1509, 2-5-96)

Sec. 36-9. Permits.

(a) Sign permits shall be required for all signs unless otherwise stated in this chapter.

(b) Signs not requiring permits under this chapter shall be as follows:

(1) Accessory use signs.

(2) Change of copy on legally established signs.

(3) Construction/renovation signs (those not exceeding 16 square feet in sign area).

(4) Decorations for national holidays or communitywide festivals and fiestas.

(5) Directional signs.

(6) Flags/decorations.

(7) Garage sale signs.

(8) Government signs.

(9) House or building signs or nameplates.

(10) Information signs.

(11) Legal notices.

(12) Model complex signs (those not exceeding 16 square feet in sign area).

(13) National, state and corporate flags following accepted flag protocol.

(14) Pennants.

(15) Point-of-sale signs.

(16) Political signs, except billboards.

(17) Private sale or event signs.

(18) Product identification signs.

(19) Promotional displays, residential.

(20) Railroad signs.

(21) Real estate broker identification signs.

(22) Real estate directional signs.

(23) Real estate signs (those not exceeding 16 square feet in sign area).

(24) Streamers.

(25) Vehicle signs.
(Ord. No. 1128, §§ G, I.6, 5-18-90)

Sec. 36-10. Prohibited signs.

(a) Any sign not expressly permitted within this chapter is prohibited.

(b) A sign placed or painted on any motor vehicle, recreational vehicle, trailer or other movable device that reasonably indicates the use of such vehicle, trailer or device as a sign is prohibited. This includes the parking of such vehicle, trailer or device in such a manner as to constitute a sign. This does not include vehicles, etc., used in the course of normal business activities.

~~(c) A flashing, rotating or animated sign, or a sign with intermittent or varying intensity of illumination, whether deliberate or resulting from a defect in the sign or light source, is prohibited.~~

(c~~d~~) Any sign constructed to resemble any official marker or sign normally erected by a city, state or federal government agency or a sign using words, phrases, symbols or characters in such a manner as to interfere with, mislead or confuse traffic is prohibited.

(d~~e~~) A sign advertising activities that are illegal according to federal or state laws, rules or regulations and county or city ordinances or resolutions is prohibited.

(e~~f~~) The city, civic groups and non-profit entities who desire to utilize the city utility poles for placement of banners or other signs or attachments may do so only for a large event, celebration or festival of city-wide interest or other community or county-wide attraction. Such events, celebrations, festival or attraction are those events, celebrations, festivals or attractions which are designed to attract large numbers of city residents and tourists, may occur on an annual or semi-annual basis and which promote the city's history, natural and cultural beauty, art, cuisine and/or athletic events (e.g. The Whole Enchilada Festival, Gus Macker Basketball Tournament, Border Book Festival, The Renaissance Fair, the Fourth of July).

(1) A special sign permit shall be obtained, indicating the dates of display, number of banners to be displayed, location(s) of display, etc. and must be approved by the city manager or designee.

(2) All banners shall be installed and removed either by the city or the entity requesting the display.

a. If installed and removed by the city, permit fees shall be based on the number of banners to be installed/removed at a rate approved by the city council (Resolution #00-360). Permit fees shall be paid by the applicant upon permit approval and in advance of sign installation.

b. If installed and removed by the entity requesting the display the city requires a minimum of $1,000,000.00 insurance, with the city being named as an additional insured party and the entity must provide a hold harmless indemnity agreement, not holding the city responsible for any accidents or loss in the installation/removal of the banners.

(3) Banners shall be restricted to placement on city-owned utility/light poles only.

(4) Banners shall only be displayed along major arterials, as defined by the city metropolitan planning organization transportation plan.

(5) The maximum length of display shall be determined by the length of the event being advertised. Banners are permitted to be displayed one and one-half times the length of the event being advertised. The one-half amount of days is permitted to be utilized prior to the event. (Example: event is ten days, display permitted 15 days total, banners can be displayed five days prior to event.)

(6) Any aggrieved person, department, commission, board, or bureau that is affected by a decision of an administrative official in the administration of this section may appeal such decision to the city council. Such appeal must be in writing within 15 days after the decision and must be filed with the city clerk.

(~~f~~g) Any sign illegally placed, constructed or maintained is prohibited. (Ord. No. 1128, § H, 5-18-90; Ord. No. 1526, 4-1-96; Ord. No. 1854, § II, 2-5-01)

Sec. 36-11. Placement.

(a) No sign shall be permitted to violate the clear sight triangle as defined in this chapter.

(b) No sign shall obstruct any door, stairway, fire escape or opening intended to provide ingress and egress for any building or structure.

(c) Signs may not be located in a manner that obscures or interferes with the effectiveness of any official sign, signal or device. A sign shall not be placed at any location where it obstructs or interferes with the clear view of any traveler on any street.

(d) No sign shall be constructed within any public right-of-way or sidewalk nor shall any portion of any sign extend onto or over a public right-of-way or sidewalk unless a specific exception is provided for in this chapter.

(e) No permit for a sign that extends beyond private property onto a public street, public sidewalk or public alley will constitute a permanent easement. Every such permit shall be revocable by the sign administrator. The city shall not be liable for any damages to the owner because of such revocation.

(f) No banner shall be erected across any street or sidewalk in the city unless express written consent has been granted by the city manager or acting city manager.

(g) Any sign extending over an area intended for pedestrian use shall not be less than seven feet, four inches above the finished grade below it.

(h) No sign shall be placed on any property without written consent of the owner or the owner's authorized agent.

(i) No part of any sign may protrude into the setback except as follows:

(1) If the right-of-way extends 15 feet beyond the back of the curb, a sign may be placed on the property line. A written agreement between the city and the property owner shall be initiated to ensure that the sign will be relocated at the owner's expense if the roadway is ever widened at the sign location.

(2) Real estate signs may be located within the setback; however, they shall not encroach in any way into the public right-of-way or clear sight triangles.

(j) Every sign shall be identified by a label, nameplate or trademark designating the manufacturer and installer of the sign. Signs not requiring permits shall be exempt from this subsection.

(k) No temporary or permanent sign shall be placed on public property, with the exception of signs lawfully permitted. Any unlawful sign found in a public right-of-way or on public property shall be seized, and removal is authorized.
(Ord. No. 1128, § I.7, 5-18-90)

Sec. 36-12. Lighting.

(a) Light from any light source intended to illuminate a sign shall be shaded, shielded, or directed in such a way so that the light intensity or brightness shall not adversely affect the safe vision of pedestrian or vehicle operators on public or private streets, driveways, or parking areas, and shall not adversely affect any of the surrounding premises. Illumination from any sign shall not interfere with the effectiveness of any official traffic sign, signal or device.

(b) Signs which face residentially zoned lots having a linear distance of 75 feet or less from that zone shall not be illuminated.

(c) Signs in residential zones shall not be illuminated with the exception of a house or building sign or nameplate.
(Ord. No. 1128, § I.8, 5-18-90)

Sec. 36-13. Enforcement.

(a) *Violations and penalties.* Any person who shall violate any section of this chapter shall be guilty of an offense and shall, upon conviction, be punished by a fine of not less than $50.00 and not more than $300.00 for each violation. Each day in which any violation shall occur shall constitute a separate offense. In addition, the city attorney is authorized to take all actions, both legal and equitable, necessary to ensure compliance with this chapter.

(b) *Enforcement authority.*

(1) The police department, through its codes enforcement division, is authorized to issue citations for violations of this chapter and to file criminal complaints in municipal court alleging violations of this chapter.

(2) The municipal court may impose a fine for each offense, not to exceed $300.00 for each day the violation is found to have occurred. In addition to any fines thus imposed, the municipal court is authorized to issue orders of the court to remove structures it finds in violation of this chapter. Failure to comply with any such orders for removal or other judgments of the municipal court, including failure to pay fines previously imposed, shall constitute contempt of court and may be separately punished at the discretion of the municipal court.

(Ord. No. 1128, § I.4.f, 5-18-90)

Secs. 36-14--36-40. Reserved.

ARTICLE II.

ON-PREMISES SIGNS*

* **Cross References:** Licenses, taxation and miscellaneous business regulations, ch. 16.

Sec. 36-41. General conditions.

The following general conditions apply to on-premises signs:

(1) *Accessory use sign.*

a. The primary purpose of the sign must be corporate/business identification and not advertising per se.

b. The object into which the sign is incorporated must serve a functional purpose and be an item which is normally associated with the type of business or enterprise for which it is being used.

(2) *Attached sign.* No attached sign shall extend beyond the highest point of a roofline, or project beyond the edge of any wall.

(3) *Decorations.* Any display shall be removed no later than five days after the event/holiday.

(4) *Development identification sign (permanent.).*

a. The maximum sign area shall not exceed 32 square feet.

b. The maximum height shall not exceed ten feet.

c. The sign may be placed in the public right-of-way, provided prior approval has been granted by city manager or designee.~~council.~~

d. This sign may be used in addition to any other freestanding sign allowed pursuant to this chapter.

(5) *Directional sign.* Directional signs visible from the public right-of-way (i.e., entrance/exit) shall not exceed six square feet in sign area and four feet in height.

(6) *Flags.*

a. Displays incorporating the identification of a nation, state or corporation shall follow accepted flag protocol. Only one corporate flag will be allowed per lot.

b. Displays used to serve as decoration, exclusive of decorations used in fiestas, communitywide festivals or national holidays, shall have no logo or advertising message printed or painted on them. These may be used in addition to the regular signage allowed per business.

(7) *Freestanding sign.* All signs classified as freestanding are limited to locations along street segments meeting specific zoning criteria further defined elsewhere in this chapter.

(8) *Gate entrance sign.*

a. The sign may identify the owner, resident or name of a certain parcel of property (i.e., John Doe Ranch, etc.).

b. Total sign height, including poles, shall not exceed 20 feet. The sign face itself shall not exceed three feet in height and 30 feet in width.

(9) *Information sign.* Signs visible from the public right-of-way shall have a maximum size of four square feet in sign area.

(10) *Legal notices.* These signs are exempt from the requirements of this chapter; however, they must comply with provisions for the clear sight triangle.

(11) *Pennant.* These displays may be used in addition to the regular signage allowed per business.

(12) *Point-of-sale sign.*

a. This sign shall limit its advertisement to the product, its price, and its manufacturer.

b. The cumulative sign area for these signs shall not exceed 20 square feet.

c. Each sign shall be no larger than two square feet in sign area.

(13) *Portable sign.*

a. Portable signs, although not incorporating a permanent footing in their design, shall be securely anchored to the ground to prevent overturning in high winds.

b. Portable signs shall be placed on level ground only or leveled during setup.

c. Portable signs shall for purposes of this chapter be subject to all on-premises provisions governing freestanding signs.

(14) *Product identification sign.* The sign shall be placed on the structure and shall not exceed one-third square foot in sign area.

(15) *Real estate broker identification sign.* The sign area shall not exceed two square feet.

(16) *Special use sign.*

a. The maximum number of signs allowed for each location shall be limited to one freestanding sign and one attached sign.

b. Height requirements are established in appendix 1 to this chapter. Each sign shall not exceed 20 square feet in sign area.

c. Examples where the sign requirements of this subsection would apply include the following:

1. Cemeteries located within R-1 zones.

2. Golf courses and country clubs located within an R-3 zone.

d. When special use permits are granted pursuant to chapter 38, the requirements of this subsection shall apply.

Exception. If a special use permit is granted for a location within a zone designation (i.e., C-2, M-1) that allows greater signage, the requirements specific to that zone shall apply.

(17) *Streamers.* These displays may be used in addition to the regular signage allowed per business.

(18) *Wall sign.* No wall sign may be extend more than 12 inches in depth out from the wall to which it is attached.

(19) *Window sign.*

a. Permanent window signs may be substituted for wall signage with a corresponding reduction of wall signage.

b. A window sign does not include merchandise or models of products or services incorporated in a window display.

(Ord. No. 1128, § C.1, 5-18-90)

Sec. 36-42. Single FamilyResidential zones REM, RE, EE, R-1aM, R-1bM, R-1cM, R-1a, R-1b, R-1c.

~~In residential zones REM, RE, R-1aM, R-1bM, R-1cM, R-1a, R-1b, and R-1c,~~ ~~t~~The following ~~on-premises~~ sign types are permitted: development identification sign; directional sign; garage sale sign; gate entrance sign, government sign; house or building sign or nameplate; legal notices; model complex sign; national, state and corporate flags; political sign; private sale or event sign; real estate broker identification sign; real estate sign; and a special use sign, pursuant to requirements stated elsewhere in this chapter.
(Ord. No. 1128, § C.2, 5-18-90; Ord. No. 1444, 4-3-95)

~~**Sec. 36-43. Residential zones EE, UR, RA.**~~

~~In residential zones EE, UR, and RA, the following on-premises sign types are permitted: development identification sign; directional sign; garage sale sign; gate entrance sign; government sign; house or building sign or nameplate; legal notices; model complex sign; national, state and corporate flags; political sign; private sale or event sign; real estate broker identification sign; real estate sign; and a special use sign, pursuant to requirements stated elsewhere in this chapter.~~
~~(Ord. No. 1128, § C.3, 5-18-90)~~

Sec. 36-443. Multi-family Residential zones R-2, R-3, R-4.

~~(a)~~ *Permitted signs.* ~~In residential zones R-2, R-3, and R-4, t~~The following ~~on-premises~~ sign types are permitted: development identification sign; directional sign; flags/decorative; garage sale sign; government sign; house or building sign or nameplate; legal notices; model complex sign; national, state and corporate flags; political sign; private sale or event sign; real estate broker identification sign; real estate sign; and a special use sign, pursuant to requirements stated elsewhere in this chapter.

~~(b) *Signs for professional offices.* Attached signage for professional offices shall adhere to the following:~~

~~(1) One square foot of signage for each linear foot of the building's exterior wall shall be allowed.~~

~~(2) The wall shall front on a dedicated public street.~~

~~(3) The sign shall be placed on the side of the building used to calculate the square footage of the sign.~~

~~(4) Only wall signs will be permitted.~~

(Ord. No. 1128, § C.4, 5-18-90)

Sec. 36-~~45~~4. Flood Control~~Agricultural~~ zones FC~~A-1, A-2~~.

~~In agricultural zones A-1, A-2, t~~The following ~~on-premises~~ signs are permitted:

(1) One freestanding sign, one attached sign or a combination of both shall be permitted for advertising purposes only. In no event shall the total square footage of both signs exceed 32 square feet in sign area.

(2) Sign types allowed include: development identification sign; directional sign; flags/decorative;~~ garage sale sign;~~ government sign;~~ house or building sign or nameplate;~~ legal notices; national, state and corporate flags; point-of-sale sign; political sign; private sale or event sign; real estate broker identification sign; real estate sign; and a special use sign, pursuant to requirements stated elsewhere in this chapter.

(Ord. No. 1128, § C.5, 5-18-90)

Sec. 36-~~46~~5. Office, neighborhood commercial zones O-1, O-2, C-1.

(a) *Attached signage.* ~~In office, neighborhood commercial zones O-1, C-1, e~~One square foot of on-premises signage for each linear foot of exterior wall shall be allowed. The sign shall be placed on the side of the building used to calculate the square footage of the sign. The following are considered attached signs: awnings signs, canopy or marquee signs, banners, roof signs, window signs and wall signs. These attached signs are subject to the design standards of all applicable codes.

(b) *Freestanding signs.* These signs must comply with the following conditions:

(1) Locations which permit freestanding signs are determined by zoning districts along specific segments of streets. When the percentage of office, commercial or industrial zoning equals or exceeds 60 percent of the total street frontage for that segment, all criteria governing freestanding signs shall apply. When the percentage is less than 60 percent, the maximum height of freestanding signs shall be 12 feet, unless a more restrictive height limitation is mentioned elsewhere in this chapter, in which case the more restrictive height limitation shall apply.

(2) The maximum height and minimum setbacks for freestanding signs are determined by street classification. See appendix 1 to this chapter pertaining to development standards.

(3) Individual freestanding signs shall be limited to those businesses that own direct, unobstructed (on-site) access to the public street.

(4) Frontage on a controlled access public street, where under normal conditions a driveway permit would not be granted to that business, shall not be included in the calculation for freestanding signage.

(5) The size of freestanding signs is determined as follows:

Linear Street Frontage (feet)	Size Allowed (square feet)
0--100	50
101--300	75
301--600	100
>600 (see subsection (b)(6) of this section)	100

On lots with more than one street frontage, only one street frontage shall be used to calculate the permitted sign size, height and number of signs.

(6) The number of freestanding signs is limited to one per lot, except where the frontage of the lot exceeds 600 linear feet. For those lots, two freestanding signs are permitted, provided there is a minimum distance of 200 feet between the signs.

(Ord. No. 1128, § C.6, 5-18-90; Ord. No. 1476, 9-3-95)

Sec. 36-47~~6~~. ~~General e~~Commercial and Industrial zones C-2, C-3~~, C-4~~Mtech, M-1 and M-2, M-3.

(a) *Attached signage.* ~~In general commercial zones C-2, C-3, and C-4,~~ 1 1/2 square feet of on-premises signage for each linear foot of exterior wall is permitted. The sign shall be placed on the side of the building used to calculate the square footage of the sign. The following are considered attached signs: awning signs, canopy or marquee signs, banners, roof signs, window signs and wall signs. These attached signs are subject to the design standards of all applicable codes.

(b) *Freestanding signage.* These signs must comply with the following conditions:

(1) Locations which permit freestanding signs are determined by zoning districts along specific segments of streets. When the percentage of office, commercial or industrial zoning equals or exceeds 60 percent of the total street frontage for that segment, all criteria governing freestanding signs shall apply. When the percentage is less than 60 percent, the maximum height of freestanding signs shall be 12 feet, unless a more restrictive height limitation is mentioned elsewhere in this chapter, in which case the more restrictive height limitation shall apply.

(2) The maximum height and minimum setbacks for freestanding signs are determined by street classification. See appendix 1 to this chapter pertaining to development standards.

(3) Individual freestanding signs shall be limited to those businesses that own direct, unobstructed (on-site) access to the public street.

(4) Frontage on a controlled access public street, where under normal conditions a driveway permit would not be granted to that business, shall not be included in the calculation for freestanding signage.

(5) The size of freestanding signs is determined as follows:

Linear Street Frontage (feet)	Size Allowed (square feet)
0--100	100
101--300	150
301--600	200
>600	200

On lots with more than one street frontage, only one street frontage shall be used to calculate the permitted sign size, height and number of signs.

(6) The number of freestanding signs is limited to one per lot, except where the frontage of the lot exceeds 600 linear feet. For those lots, two freestanding signs are permitted, provided there is a minimum distance of 200 feet between the signs.

(Ord. No. 1128, § C.7, 5-18-90; Ord. No. 1476, 9-3-95)

~~**Sec. 36-48. Manufacturing zones M-1 and M-2.**~~

-

~~(a) *Attached signage.* In manufacturing zones M-1 and M-2, 1 1/2 square feet of on-premises signage for each linear foot of exterior wall shall be permitted. The sign shall be placed on the side of the building used to calculate the square footage of the sign. The following are considered attached signs: awning signs, canopy or marquee signs, banners, roof signs, window signs and wall signs. These attached signs are subject to the design standards of all applicable codes.~~

-

~~(b) *Freestanding signage.* These signs must comply with the following conditions:~~

-

~~(1) Locations which permit freestanding signs are determined by zoning districts along specific segments of streets. When the percentage of office, commercial or industrial zoning equals or exceeds 60 percent of the total street frontage for that segment, all criteria governing freestanding signs shall apply. When the percentage is less than 60 percent, the maximum height of freestanding signs shall be 12 feet, unless a more restrictive~~

~~height limitation is mentioned elsewhere in this chapter, in which case the more restrictive height limitation shall apply.~~

~~(2) The maximum height and minimum setbacks for freestanding signs are determined by street classification. See appendix 1 to this chapter pertaining to development standards.~~

~~(3) Individual freestanding signs shall be limited to those businesses that own direct, obstructed (on-site) access to the public street.~~

~~(4) Frontage on a controlled access public street, where under normal conditions a driveway permit would not be granted to that business, shall not be included in the calculation for freestanding signage.~~

~~(5) The size of freestanding signs is determined as follows:~~

~~Linear Street Frontage (feet)~~	~~Size Allowed (square feet)~~
~~0–100~~	~~100~~
~~101–300~~	~~150~~
~~301–600~~	~~200~~
~~>600 (see subsection (b)(6) of this section)~~	~~200~~

~~On lots with more than one street frontage, only one street frontage shall be used to calculate the permitted sign size, height and number of signs.~~

~~(6) The number of freestanding signs is limited to one per lot, except where the frontage of the lot exceeds 600 linear feet. For those lots, two freestanding signs are permitted, provided there is a minimum distance of 200 feet between the signs.~~

~~(Ord. No. 1128, § C.8, 5-18-90; Ord. No. 1476, 9-3-95)~~

Sec. 36-49~~7~~. Business centers (various zones).

(a) *Attached signage.* For business center, 1 1/2 square feet of on-premises signage for each linear foot of exterior wall is permitted, provided that any business shall be allowed a minimum of 100 square feet of signage. The sign shall be placed on the side of the building used to calculate the square footage of the sign. The following are considered attached signs: awning signs, canopy or marquee signs, banners, roof signs, window signs and wall signs. These attached signs are subject to the design standards of all applicable codes.

(b) *Freestanding signage.* Freestanding signs must comply with the applicable freestanding sign criteria for the district they are located in.

~~(b) *Freestanding signage.* Freestanding signs must comply with the following conditions:~~

(1) Locations which permit freestanding signs are determined by zoning districts along specific segments of streets. When the percentage of office, commercial or industrial zoning equals or exceeds 60 percent of the total street frontage for that segment, all criteria governing freestanding signs shall apply. When the percentage is less than 60 percent, the maximum height of freestanding signs shall be 12 feet, unless a more restrictive height limitation is mentioned elsewhere in this chapter, in which case the more restrictive height limitation shall apply.

(2) The maximum height and minimum setbacks for freestanding signs are determined by street classification. See appendix 1 to this chapter pertaining to development standards.

(3) Individual freestanding signs shall be limited to those businesses that own direct, unobstructed (on-site) access to the public street.

(4) Frontage on a controlled access public street, where under normal conditions a driveway permit would not be granted to that business, shall not be included in the calculation for freestanding signage.

(5) The size of freestanding signs is determined as follows:

Linear Street Frontage (feet)	Size Allowed (square feet)
0–100	100
101–300	150
301–600	200
>600 (see subsection (b)(6) of this section)	200

On lots with more than one street frontage, only one street frontage shall be used to calculate the permitted sign size, height, and number of signs.

(6) The number of freestanding signs is limited to one per lot, except where the frontage of the lot exceeds 600 linear feet. For those lots, two freestanding signs are permitted, provided there is a minimum distance of 200 feet between the signs.

(Ord. No. 1128, § C.9, 5-18-90; Ord. No. 1476, 9-3-95)

Sec. 36-~~50~~48. Sign regulations in overlay zone districts.

Refer to the following Zoning Code ~~sections~~ for information regarding signs that are located within the overlay districts throughout Las Cruces including the

(a) CBD Central Business District, ~~and Main Street Plaza overlay zone, section 38-1152.~~

~~(b)~~ the University Avenue corridor overlay zone ~~district, section 38-1321.~~

~~(c) Avenida de Mesilla gateway overlay zone district, section 38-1506.~~

~~(d) West Mesa Industrial Park overlay zone district, section 38-1571 et seq.~~, and others.

(Res. No. 92-084, § C.10, 10-19-92; Ord. No. 1725, § I, 3-1-99)

Secs. 36-~~51~~0--36-80. Reserved.

ARTICLE III.

OFF-PREMISES SIGNS

Sec. 36-81. Attached signs.

No attached off-premises signs shall be permitted.
(Ord. No. 1128, § D.1, 5-18-90)

Sec. 36-82. Public area signs.

(a) With the approval of the city manager, bus benches and bus shelters may be placed in the public right-of-way along bus routes or in areas frequented by pedestrians. In addition, signs may be placed on benches and shelters and in landscaped medians, parks, trails, and arroyos that are adopted public areas.

(b) No commercial (other than a business name as specified in (c) below) or political advertising shall be placed upon bus benches, bus shelters, or in other public areas.

(c) Benches, shelters, and medians donated or maintained by individuals or businesses may have signs designed by the city with the inscription "adopted by..." and further regulated by:

(1) The sign on benches shall be no larger than three inches high by 18 inches long.

(2) The sign on shelters shall be no larger than 12 inches high by 48 inches long.

(3) The sign in medians shall be no larger than 12 inches high by 18 inches long.

(4) The sign in parks, trails, and arroyos shall be no larger than 18 inches high by 24 inches wide.

(d) Bus benches are exempt from the location restrictions for freestanding signs only when they are located at designated bus stops.

(e) This section shall not apply to any benches placed under the terms of any contract in effect on the effective date of the ordinance from which this chapter derives. (Ord. No. 1128, § D.2, 5-18-90; Ord. No. 2141, § I, 10-4-04)

Sec. 36-83. Billboards.

(a) ~~All b~~Billboards shall be located only in areas zoned C-2, C-3, M-1~~, or~~ M-2, or M-3~~and only along streets designated as major arterials or interstate highways. Billboards shall not be located within any other zoning district~~.

(b) Billboards may ~~must~~ be located only along the following roadways and only along street segments having a minimum of 75 percent office, commercial or industrial zoning. (a street segment is defined as that length of a roadway located between intersections of two collector or higher classified roadways.)

Interstate 10	Interstate 25
Batann Memorial East and West (west of Porter Drive)	
Main Street	Picacho Avenue
Amador Avenue	Lohman Avenue (west of Interstate 25)
Solano Drive	El Paseo Road
Valley Drive	Motel Blvd (south of Picacho)
Telshor Blvd (north of Lohman)	

(c) ~~No billboards will be erected within the downtown area as defined in section 36-3.~~

~~(d)~~ Total sign area, spacing, height and setbacks shall be subject to the following requirements:

(1) Billboards located along interstate highways shall not exceed 400 square feet of total sign area, shall be spaced a minimum of 1,000 feet away from any other billboard~~apart measured radially~~ and shall not exceed 40 feet in height measured from ground level.

(2) All other b~~B~~illboards ~~located along major arterials~~ shall not exceed 300 square feet of total sign area, shall be spaced a minimum of 1,000 feet away from any other billboard~~apart measured radially~~ and shall not exceed 30 feet in height measured from ground level. There shall be a minimum clearance of 15 feet measured from the ground level to the bottom of the billboard face.

(3) A maximum of two faces, parallel back-to-back is permitted, provided both faces are of the same size and attached to the same pole for support. Sign faces must be relatively perpendicular to the designated roadway and~~E~~ each face shall not advertise more than one message.

(4) Billboards shall be supported by a maximum of two upright poles.

(5) Vertical or horizontal stacking of billboards is prohibited.

(6) Billboards shall be set back a minimum of 15 feet from the property line fronting along the designated roadway. Except for billboards ~~major arterials and 30 feet from the property line~~ fronting along interstate highways, the setback from the designated roadway shall not exceed one third of the property depth. In each case there shall be a minimum of five feet from all other property lines measured from the property line to any portion of the billboard structure.

(7) Billboards shall have a minimum sign area of 72 square feet.

(Ord. No. 1128, § D.3, 5-18-90)

Sec. 36-84. Garage, private sale or event signs.

(a) Off-premises signs may be used to advertise any garage sale, private sale or event, provided that the signs are not over three square feet in sign area and are used only during the duration of the event.

(b) The person erecting the sign and the property owner at the sign location shall be responsible for sign removal and all other requirements concerning signs.

(Ord. No. 1128, § D.4, 5-18-90)

Sec. 36-85. Government signs.

(a) Traffic control and similar signs are exempt from all requirements of this chapter.

(b) Building identification signs and similar signs do not require permits; however, they must meet the numerical requirements of this chapter.

(Ord. No. 1128, § D.5, 5-18-90)

Sec. 36-86. Political signs.

(a) No individual political sign shall exceed 32 square feet in sign area.

(b) All political signs may be erected no sooner than 90 days before the election and/or caucus to which they pertain and shall be removed within ten days following the same election and/or caucus.

(c) Advertising on a duly permitted billboard shall be exempt from the size and time limits stated in this section.

(d) Political signs are permitted to be placed on fences/walls (e.g. chain link fences, retaining walls, rockwalls), but are not permitted to be placed in clear sight triangles or in a manner that would prevent clear sight of vehicles (See section 32-405 of the Municipal Code).
(Ord. No. 1128, § D.6, 5-18-90; Ord. No. 2111, §§ I, II, 6-21-04)

Sec. 36-87. Vehicle signs.

Off-premises vehicle signs are permitted, provided the vehicle is:

(1) For sale and the purpose of the sign relates to its sale;

(2) Placed and is for some purpose other than advertising; or

(3) Contributing to the legitimate purposes of the business for which it is used.

(Ord. No. 1128, § D.7, 5-18-90)
Cross References: Traffic, ch. 27.

Sec. 36-88. Athletic field signs.

(a) Signs shall be permitted to be displayed on the inside of fences surrounding individual athletic fields, with the side facing the playing field.

(b) Each sign shall not exceed 32 square feet in sign area.

(c) The signs shall not be permitted to extend above or beyond the edges of the fence.

(d) Freestanding signs and attached signs are not permitted.
(Ord. No. 1128, § D.8, 5-18-90; Ord. No. 1526, 4-1-96)

Secs. 36-89. Neighborhood Signs.

(a) The maximum sign area shall not exceed 32 square feet.

(b) The maximum height shall not exceed seven feet.

(c) The sign may be placed on residential property or in the public right-of-way, provided prior approval has been granted by city manager or designee.

Secs. 36-90--36-115. Reserved.

ARTICLE IV.

TEMPORARY SIGNS

Sec. 36-116. Construction/renovation signs.

(a) Construction/renovation signage shall not exceed 64 square feet in sign area, and shall not be erected until a building permit has been secured. The sign shall be removed not later than 14 days after the issuance of a certificate of occupancy or the building permit expires.

(b) Signs less than 16 square feet in sign area do not require a sign permit and shall not be assessed a permit fee.

(c) Signs which exceed 16 square feet in sign area require a sign permit and shall be assessed the applicable permit fee.
(Ord. No. 1128, § E.1, 5-18-90)

Cross References: Buildings and building regulations, ch. 30.

Sec. 36-117. Real estate signs.

(a) *Residentially zoned lots or parcels.* Real estate signs are permitted for residentially zoned lots or parcels as follows:

(1) For less than 1.00 acre: one sign per street frontage not to exceed four square feet in sign area per sign. The sign shall not exceed seven feet in height.

(2) For 1.01 to 5.00 acres: one sign per street frontage not to exceed 32 square feet in sign area per sign. The sign shall not exceed eight feet in height.

(3) For 5.01 to 10.00 acres: two signs not to exceed 32 square feet in sign area per sign. The sign shall not exceed eight feet in height.

(4) For greater than 10.00 acres: three signs not to exceed 32 square feet in sign area per sign. The sign shall not exceed eight feet in height.

(b) *All other zoned lots or parcels.* Real estate signs for all other zoned lots or parcels are permitted as follows:

(1) For less than 1.00 acre: one sign per street frontage not to exceed 16 square feet in sign area per sign. The sign shall not exceed eight feet in height.

(2) For 1.01 to 5.00 acres: one sign per street frontage not to exceed 32 square feet in sign area per sign. The sign shall not exceed ten feet in height.

(3) For 5.01 to 10.00 acres: two signs not to exceed 32 square feet in sign area per sign. The sign shall not exceed 15 feet in height.

(4) For greater than 10.00 acres: three signs not to exceed 64 square feet in sign area per sign or two signs not to exceed 128 square feet in sign area per sign. The sign shall not exceed 15 feet in height.

(c) *Real estate directional signs.* These signs shall not exceed six square feet in sign area.

(d) *Model complex signs.* Model complex signs shall be located on the project site and shall conform to the following:

(1) One sign per complex not to exceed 32 square feet in sign area.

(2) One sign per model not to exceed four square feet in sign area.

(3) Signs are to be removed when the complex ceases to be a model home complex.

(e) *Removal.* Signs shall be removed 72 hours after closing of sale or lease of property.

(f) *Location.* No real estate sign shall be erected in the public right-of-way or in the clear sight triangle.

(g) *Permits.*

(1) Signs which do not exceed 16 square feet in sign area do not require a sign permit and shall not be assessed a permit fee.

(2) Signs which exceed 16 square feet in sign area require a sign permit and shall be assessed the applicable permit fee.

(Ord. No. 1128, § E.2, 5-18-90)

Sec. 36-118. Commercial promotional displays.

In addition to authorized attached and freestanding signs, occasional events for commercial promotional displays requiring special advertising shall be subject to the following:

(1) Each business shall be limited to one freestanding and three attached signs. Each sign shall not exceed 100 square feet in size.

(2) Displays incorporating balloons, streamers, flags and pennants will be permitted and are not limited in size and number.

(3) Each business shall be allowed one permit for a grand opening display during its first six months of operation. The permit for this display shall be for 20 consecutive days.

(4) Each business shall be allowed four promotional displays during each calendar year. The permit for each of these displays shall be for ten consecutive days.

(5) Each business shall be allowed one bona fide going out of business display. The permit for this display shall be for 60 consecutive days.

(6) The applicant shall provide to the sign administrator the name and address of the business where the display is to be placed and the first day of the display. No portion of a display (i.e., structure or sign) shall be erected prior to the first day of the event as stated on the permit. All displays shall be removed not later than the permissible time limit stated in this section. A permit will be issued to the applicant and will remain in effect for the duration of that event. No permit fee will be assessed. A new permit is required for each event.

(Ord. No. 1128, § E.3, 5-18-90; Ord. No. 1508, 2-5-96)

Cross References: Licenses, taxation and miscellaneous businesses regulations, ch. 16.

Sec. 36-119. Residential promotional displays.

For an open house or other similar showing, the following residential promotional displays and conditions shall apply:

(1) Displays incorporating pennants, flags, streamers, banners, open house signs, welcome signs and other like signs will be allowed.

(2) The sign display may be erected any time on the day prior to the event and must be removed within 24 hours following the event.

(Ord. No. 1128, § E.4, 5-18-90)

APPENDIX 1.

DEVELOPMENT STANDARDS

TABLE 1

MAXIMUM SIGN HEIGHT BY STREET CLASSIFICATION (IN FEET)

Zone → ↓ Street Class	R-3	R-4	O-1	O-2, C-1	C-2, MT, M-1, M-2, M-3	C-3, M-3	UAC	all other zones
local	0	0	6	6	18	same	3	0
collector	6	6	12	18	18	as	3	6

minor arterial	6	12	12	18	18	building	3	6
principal arterial	12	12	18	18	30	height	3	6

-	~~Zone~~																	
~~Street Class~~	~~A-1~~	~~A-2~~	~~RE-M~~	~~RE~~	~~R-1M*~~	~~EE~~	~~UR~~	~~RA~~	~~R-1**~~	~~R-2~~	~~R-3~~	~~R-4~~	~~O-1~~	~~C-1~~	~~C-2, M-1, M-2~~	~~UAC~~	~~C-4~~
~~Local~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~6~~	~~6~~	~~18~~	~~3~~	~~same as building height~~
~~Collector~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~12~~	~~18~~	~~18~~	~~3~~	-
~~Minor arterial~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~12~~	~~12~~	~~18~~	~~18~~	~~3~~	-
~~Major arterial~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~6~~	~~12~~	~~12~~	~~18~~	~~18~~	~~30~~	~~3~~	-

-

-

~~*Including R-1aM, R-1bM, R-1cM~~

-

~~**Including R-1a, R-1b, R-1c~~

NOTE: Freestanding signs which are allowed by right and erected in the zones listed in table 1 shall follow those height requirements enumerated in the table, unless specific height requirements are stated elsewhere in this chapter.
(Ord. No. 1128, app. 1, table 1, 5-18-90; Ord. No. 1444, 4-3-95)

TABLE 2
MINIMUM SETBACK BY STREET

CLASSIFICATION

Street Class	Setback	Setback
Local	10 feet from property line	5 feet side yard
Collector	12 feet from property line	5 feet side yard
Minor arterial	15 feet from property line	5 feet side yard
~~Major~~ Principal arterial	15 feet from property line	5 feet side yard

(Ord. No. 1128, art. 1, table 2, 5-18-90)

APPENDIX 2.

EXAMPLES AND ILLUSTRATIONS

CLEAR SIGHT TRIANGLE

Clear Sight Triangle applies to both corner lots and off-street multiple parking areas. For a definition, see Clear Sight Triangle, section 36-3.

Clear Sight Triangle

Add figure

Clear Sight Triangle for entrances/exits to off-street multiple parking areas.

Add figure

Add figures for determining sign area

Add figures for off-premise signs

OFF-PREMISES SIGNS

Add figures for on-premise signs

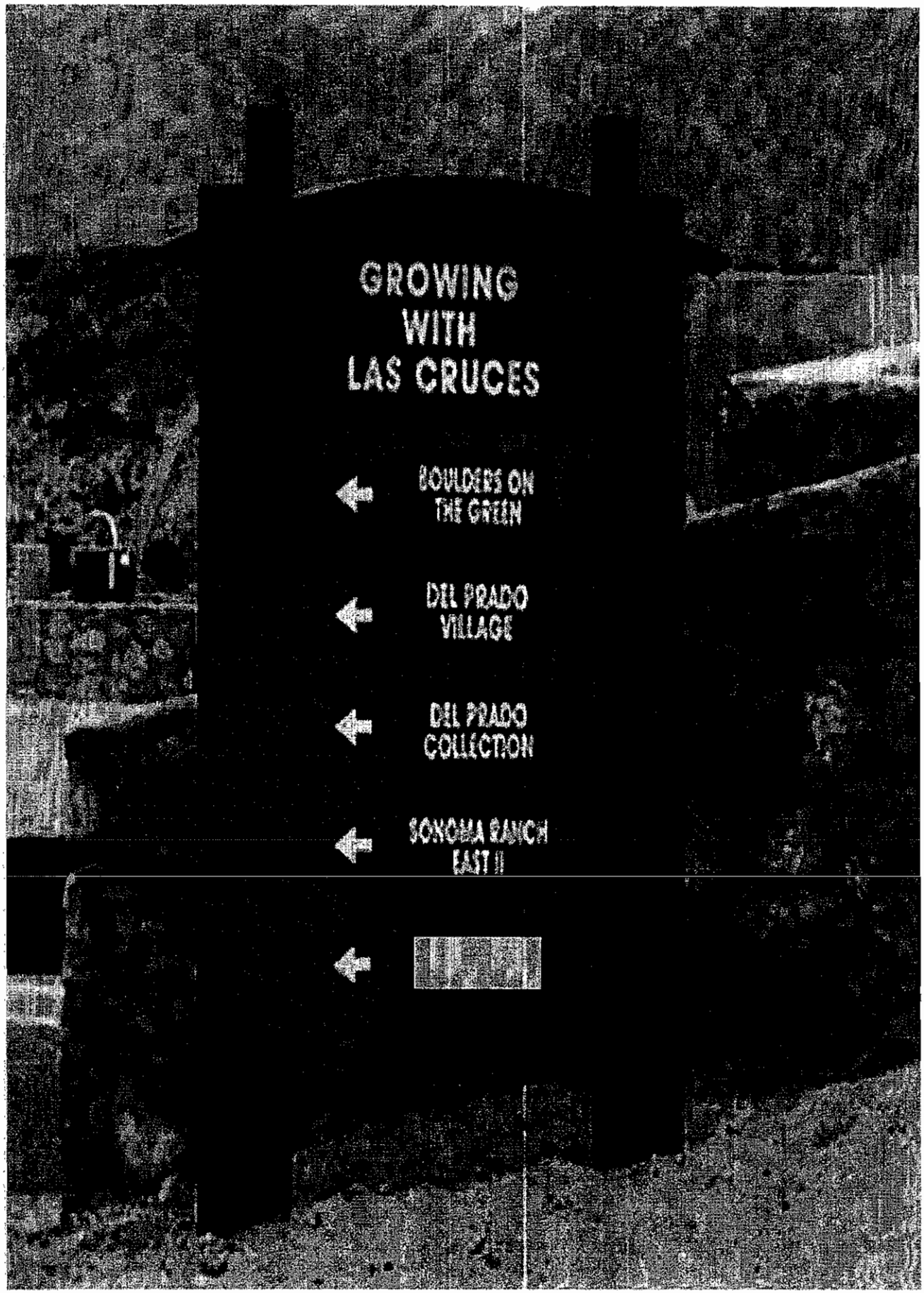
ON-PREMISES SIGNS

Add figures for on-premise signs

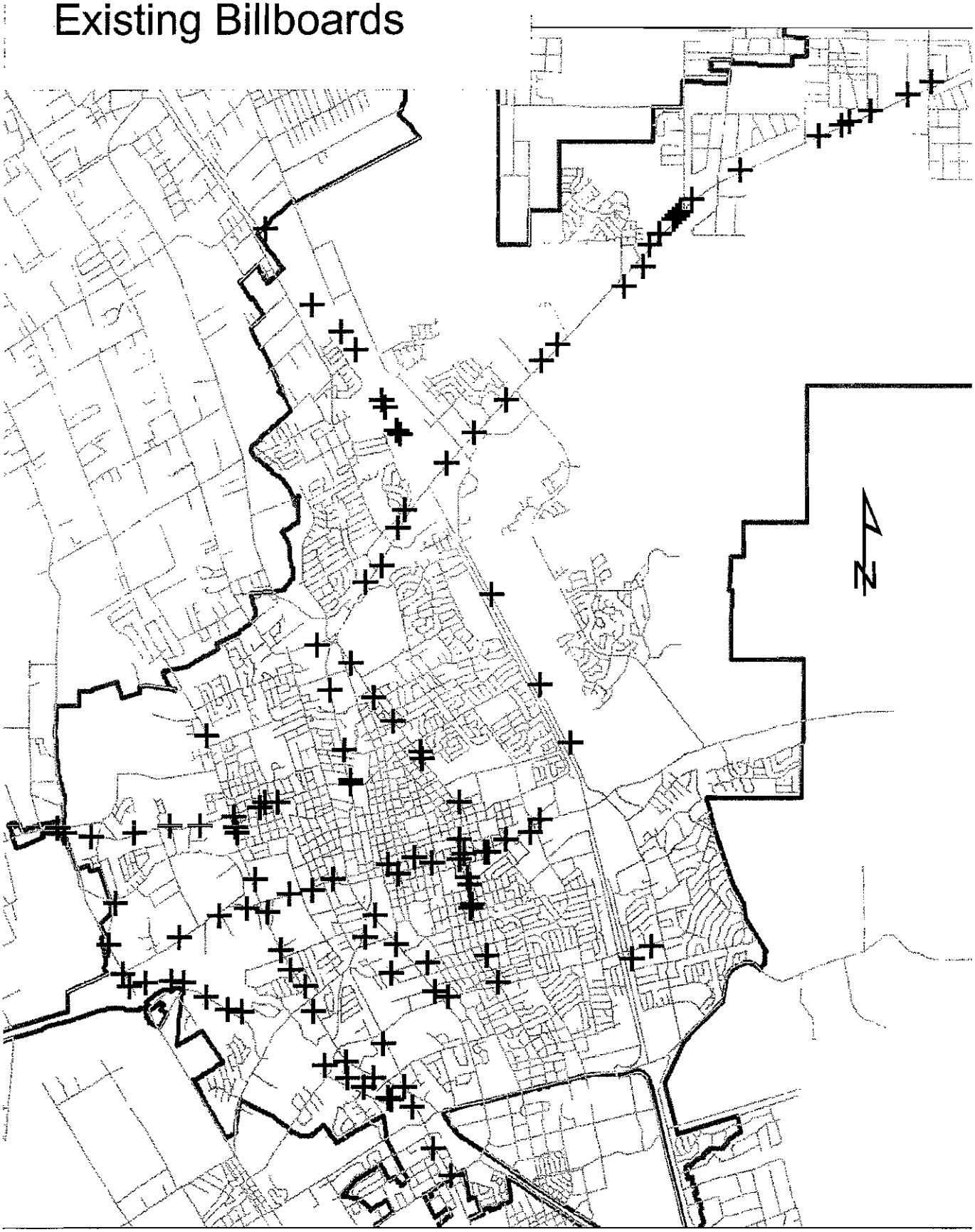
ON-PREMISES SIGNS

Add figures for on- or off-premise signs

ON- OR OFF-PREMISES SIGNS

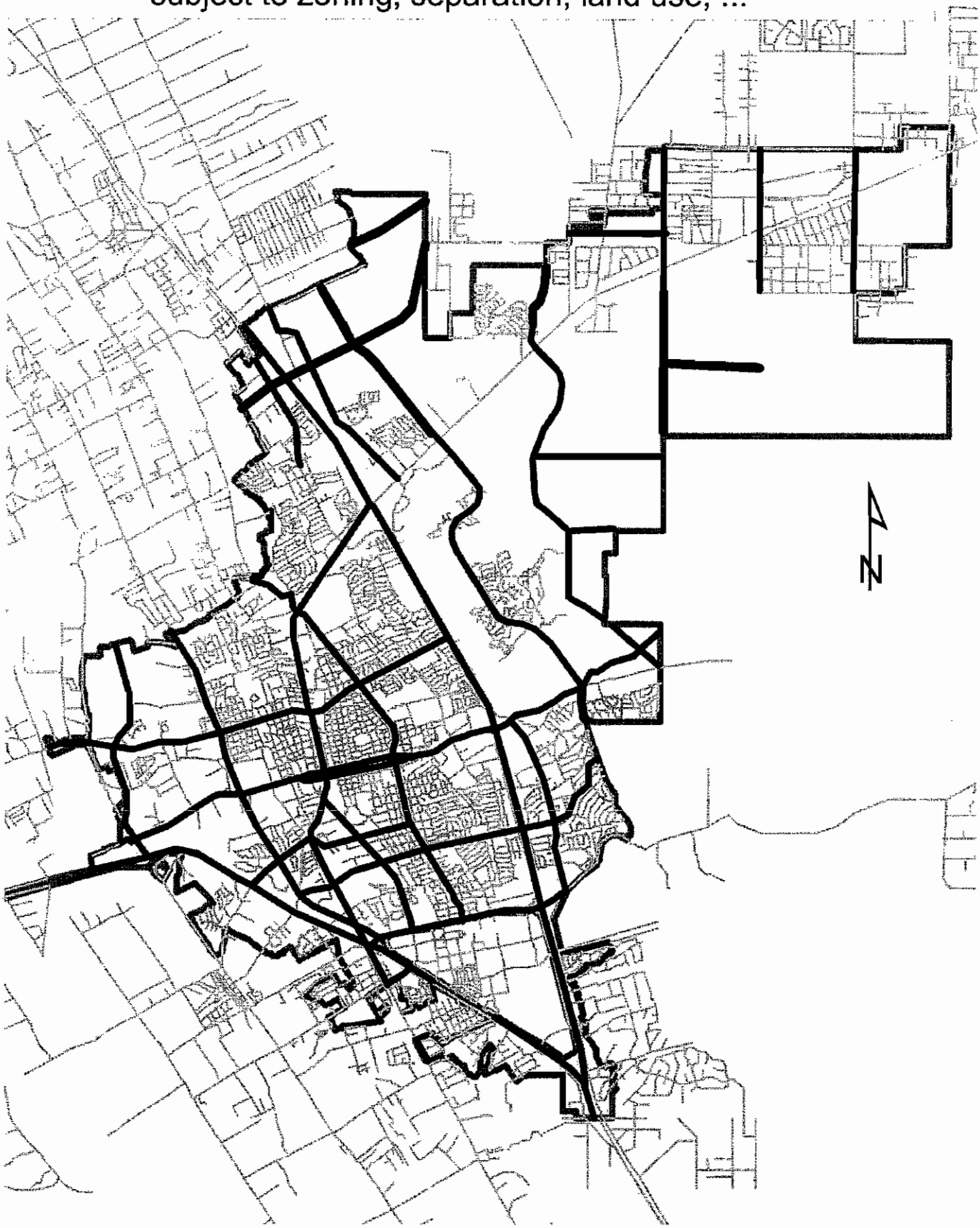

GROWING
WITH
LAS CRUCES
BOULDERS ON
THE GREEN
DEL PRADO
VILLAGE
DEL PRADO
COLLECTION
SONOMA RANCH
EAST II

Existing Billboards



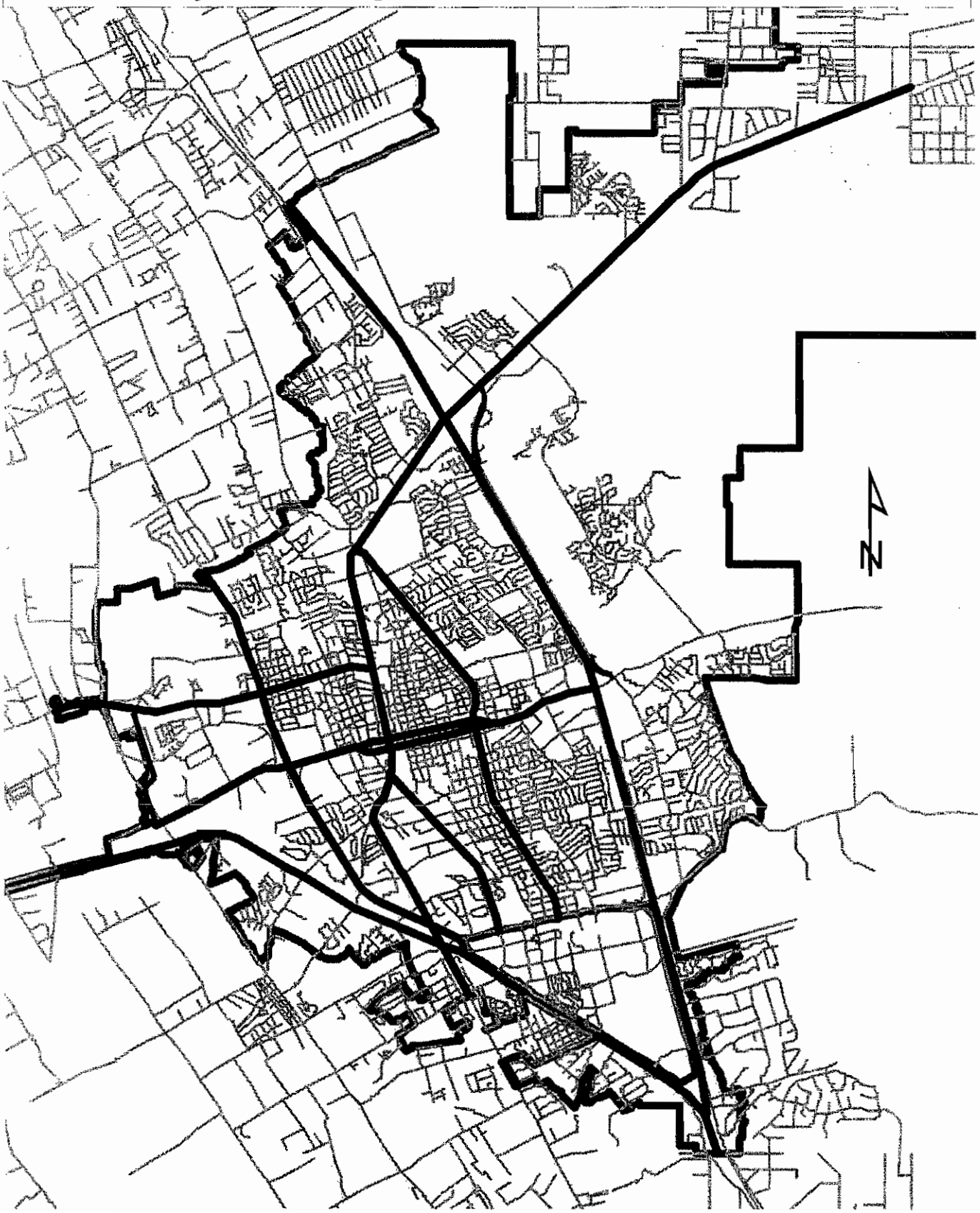
Current Sign Code. Billboards **may** be allowed

subject to zoning, separation, land use, ...



Proposed Sign Code. Billboards **may** be allowed

subject to zoning, separation, land use, ...



Public Meeting on Billboards
3/07/06

Christine Ochs made introductions and brief presentation

Vince Chavez – does the 175 billboards in L.C. include NMDOT-approved billboards on the interstates?
CO – yes, if they are within the city limits

Mark Isler – the number of billboards in 2001 is the same as now, correct?
CO – yes, there has been no net increase; 15 went up, and 15 came down

(Blond woman) – when a company applies for a billboard, does the city inspect the site?
CO – Planning staff reviews the application; if we can't tell for sure what the specs are, we ask the applicant to prove stats by providing a survey, measuring, etc.

Tammy Smith – at one time, if a billboard changed hands, i.e. had a different advertiser, it had to come into compliance. Is this still the case?
CO – It would have to come into conformity if the size, shape or construction were affected, but not its ownership or content. The city does not control content.

TS – I think there are alternatives to billboards. She references area between El Paso and Las Cruces and how trashy it looks along the highway. On the "Scenic America" website, there are suggestions for fighting billboard blight (Reads statement from website). She is sympathetic to advertisers, but some billboards are too big and too tall, and there is documentation that they are not effective. Would like to see distance doubled, height reduced, and alternatives considered so that advertisers aren't put out of business. They could be more attractive, less offensive.

Eddie Binns – will the alternatives be going to council? What are they? To whom are we addressing our comments?
CO – Feedback will go to council.

Pete Hampton – (reads statement from Chamber)

_____ -- what about the directional sign into Sonoma Ranch? There needs to be a different classification for these kinds of informational signs.

CO – asks for a show of hands of those in favor of directional/informational signs. About half.

CLC inspector guy – objects to location of directional sign. Points out that it conflicts with stop sign and could cause an accident if someone is paying attention to the sign and not the intersection.

_____ -- how do directional/informational signs get permitted? It's still advertising of a sort.

Mayor – doesn't want a moratorium. The issue is scenic views as the city expands. Endorses what realtors say to promote city "come live in Las Cruces and see the view." References the Public Lands resolution and that the Homebuilders supports protecting the views. We want to work with the billboard company, perhaps turn one sign into 3 signs. Wants a win-win situation. Sites his own situation where he had an opportunity to put up a billboard on his property but opted not to because of the proximity to residential area. He wants us to "dare to be different" and have a different approach. Loves to see our entrances to the city because they are beautiful and not ruined with billboards.

Mark Isler from NOA commented that the 3-for-1 signs wouldn't require a code change.

_____ -- How do you regulate the view?
CO – usually the height, also perspective. Could require more information regarding location and perspective.

Mayor – an overlay district would be another way.

Mark Isler – if the non-compliant billboard on El Paseo were replaced with one that is compliant, i.e. the right size, would it be OK?

Jerry Harrell – what are other cities doing?
CO – buying out the billboard companies, declaring moratoriums.

Vince Chavez – reads statement. References what's being done in Belen and Socorro.

_____ from NOA comments that Sam's Club and WalMart are interested in billboard advertising.

_____ -- is billboard fee to the City a one-time fee?
CO – yes, because it's a one-time service
_____ -- thinks the City should get an annual fee, since billboard company is receiving annual revenue

Oscar Andrade – supports billboards because for PicQuik the temporary sign permit is restrictive (although he also said it was a good policy)

_____ Granado NOA – the company pays GRT on advertising sales.

Eddie Binns – billboards serve a purpose and is a service to the community. Also are revenue generators for business. More interested in 'liberalizing' guidelines because some property owners cannot benefit from rental if they happen to be in between the 1,000 ft distance requirement. Also thinks that the subdivision information signage directs people to a neighborhood, not a specific business, and so should not be considered a billboard. Council "holds property owner hostage" with restrictive zoning. Also notes that there are no $500,000 homes on major arterials, such that views are not blocked. Thinks sign code should stay the same.

CO – asks for show of hands for those supporting replacing non-conforming billboards with less non-conforming, for example, correcting size, reducing poles, etc. Over half raised hands.

Tammy Smith – what are some of the alternatives. How about more modest directional signs directing people to business instead of big billboards?

Mark Isler – small directional signs have shown some success if you're a nationally branded company, but not local businesses. Also suggested that sign companies bring signs into compliance. This is the first step. See what kind of improvement can be made if we do this first.

Vince Chavez – comments that logo signs on highways are more visible than billboards.

____ (guy in second row who spoke last) – billboard on El Paseo is performing a public service because it advertises the lottery which benefits schools.

Meeting ended.

Billboard Meeting
City Hall, Council Chambers, 5:30pm
March 7, 2006

29 Members of the public in attendance

Staff:
Christine Ochs
Vincent Banegas
Carol McCall
Cheryl Rodriguez
Robert Garza

Meeting began at 5:30 with a presentation by Christine Ochs. Upon conclusion of the presentation, the floor was open to the public for input regarding billboards within the City of Las Cruces.

Question/Comment #1: Are the 175 billboards that are currently identified reside within the City limits and does this number include billboards along the interstate and highways?

CO: The number of billboards that are identified all reside within the City limits of Las Cruces.

Question/Comment #2: What is the availability of the new billboards today versus five years ago?

CO: 15 billboards put up but 15 billboards were taken down

Question/Comment #3: How does one apply for the permit? Do City staff check the legality of the permit request?

CO: Discussed the application process and how the planning staff review the application; Planning staff will require the applicant to prove the distance requirement.

Question/Comment #4 (from Tammy Smith): Spoke of her concerns about the general nature of billboards; Did ask about if a billboard or sign changes ownership does the City require the physical nature of the sign to come into compliance? Tammy Smith made the following recommendations: double the distance requirement, reduce the height requirement, make the billboard less offensive and more attractive.

Question/Comment #5 (from Chamber of Commerce – please refer to the handout that was submitted): Made the following statements:

- Do not support the existing ordinance
- Support public hearings

- Do not support the inability of new business to use this form (billboards) of advertising
- Support an increase in signage
- Do not support a moratorium
- Support compliance with existing changes

Question/Comment #6 (from 101 Gold ownership): New businesses use billboards as form of advertisement in addition to radio; Existing requirements are good enough

Question/Comment #7 (John Carmody – Sonoma Ranch): Referred to directional sign at Sonoma Ranch; did acknowledge that existing sign does not have permit but that the type of sign was good (majority of people in room did support the type of sign, but one member of the public did oppose the general location of the sign within the close proximity of an intersection). Consensus that the type of sign should not be classified as a billboard, but placed into a separate category with specific circumstances and design criteria.

Question/Comment #8 (Mayor): spoke about the quality of life and protection of mountain views. Spoke about the Wilderness Bill and the fact that the Homebuilders Association supports the bill due to protection of mountains and views; Did indicate that there would be no moratorium on billboards.

Question/Comment #9: How does one propose to regulate the view?

CO and Mayor: Perspective, height

Question/Comment #10: What are the current trends about billboards in other cities?

CO: Staff is doing research on what other cities are doing about billboards; referred to Scenic America website; place a cap on number of billboards; have a budget for removal of billboards

Question/Comment #11 (Vincent? Referring to comments addressed to Council on January 17, 2006): City should contract with advertising company to advertise the City at all major points into City; Before a billboard is erected, the public (that live in the affected area) should be notified.

Question/Comment #12 (John Mercurio): Asked about the application fee – is it a one-time fee? Stated that there should be an annual income to the City from billboards.

CO: Staff is reviewing all fees.

Question/Comment #13 (PicQuick representative): Support the current sign code

Question/Comment #14 (Eddie Binns): The number of billboards today from 53 years ago seem to be the same; billboards serve a community purpose; billboards are

revenue generators; does not want more restrictions on billboards; wants to see more liberalization of billboards; reduce the distance requirement; Council should not be prohibiting billboards with zone change requests.

Question/Comment #15: How many legal, nonconforming billboards are in need of repair?

CO: Hard to determine

Question/Comment #16 (from Christine Ochs to public): How many would support a notion that nonconforming billboards can remain in place but allowed to be rebuilt? The majority of people in attendance would not oppose this.

Question/Comment #17: Has the City identified the number of sites that additional billboards could go?

CO: There are 2 to 3 additional sites and those sites are not owned by the City.

Question/Comment #18 (Tammy Smith): Need to discuss the alternatives to billboards

Question/Comment #19 (Newman): Stated that their company has not received complaints about new billboards; would recommend to allow sign companies to replace the nonconforming signs.

Meeting adjourned at 6:30pm

Pete Hampton - Vice Chair of Government Affairs Division for the Greater Las Cruces Chamber of Commerce Board of Directors.

3 1. Business uses signage and billboards for advertising purposes therefore we do not support a moratorium on future billboards.

4 2. ~~For the same reasons~~ Those, we do not support the removal of existing billboards,

2 3. We do not support the inability of new businesses that are moving into the community from using this type of advertising, and we do support a proportionate increase in the number of billboards as the city and its business community grows,

1. 4. We do not support changing or amending the existing ordinance, but if it is changed or amended, we support public hearings, such as this one, which allows for business input into any changes or amendments.

Reasons We Should Pass the Ordinance

1. Billboards are in your face antiquated advertising.

2. You can't change the channel or turn the page.

3. Do we want to look like El Paso with 2,500 billboards?

4. Or Santa Fe, Taos or even Mesilla? Zero billboards. Many cities are not allowing new permits.

5. We on this side of I-25 should not be subjected to any additional billboards, after all, Sonoma Ranch on the Eastside are spared from having any.

6. Billboards are unnecessary, logo signs are enough.

7. Wal Mart does not use them and their on premise signs are very conservative.

8. McDonald's uses them extensively and their on premise signs and logo's are far from conservative.

9. I believe that a billboard at any location will devalue that property and it's neighbors as well.

10. Las Cruces has been very generous to the outdoor ad companies. We the taxpayers provide the avenues for them to display and make a profit on their product.

11. The initial permit charge is minimal and the license is forever without any annual fee.

12. They should support the passage of this ordinance. If they feel that they are extremely necessary, then the existing boards would demand a higher price.

Respectfully Yours

Vincent Chavez

1/17/06 526-2764

Christine Ochs

From: Terrence R. Moore
Sent: Tuesday, March 07, 2006 8:11 AM
To: 'RDHNM@aol.com'; HLassiter@las-cruces.org; Brian Harper
Cc: crucesjerry@msn.com; Christine Ochs; Robert Garza
Subject: RE: SCORE

Thanks for your feedback Tom. We will therefore include this commentary with all of our information to assist the City of Las Cruces' decision making process respectively. Much appreciated.

Terrence Moore

-----Original Message-----
From: RDHNM@aol.com [mailto:RDHNM@aol.com]
Sent: Monday, March 06, 2006 9:06 PM
To: Terrence R. Moore; HLassiter@las-cruces.org; Brian Harper
Cc: crucesjerry@msn.com
Subject: SCORE

Mr. Moore,

SCORE does not normally involve its self in city counsel business unless it effects business in the area. Evidently there is an issue before the council regarding billboards. I do not know what the issue is, nor does that effect what we have to express.

Billboards is the lifeblood to small business in the community. This is where small businesses get the biggest marketing bang for their buck. By comparison,the the cost for making their whereabouts known in the Sun News is outrageous and prohibitive for most startups.

Downtown redevelopement and, while it is not mentioned, El Paso redevelopement will depend upon the success of small businesses to get themselves known. To put more hurdles in the way of their success
is not wise and would be detrimental to the community.

Any action to reduce the billboards in the community will have an adverse effect on small businesses in the area. I don't like the idea of billboards in residential areas any more than you do. However, before any regulations are considered, please consider the effect those regulations might have on small business marketing in Las Cruces.

Tom Heilpern, Chair
Las Cruces SCORE

Christine Ochs

From: SDAyres2@aol.com
Sent: Saturday, March 04, 2006 6:25 AM
To: Christine Ochs
Cc: tamie.s@gmail.com
Subject: Billboards

I believe large billboards detract from the image of Las Cruces. However, some small billboards should be allowed. The only ones that should be allowed are those of interest to travelors coming in from out of town (i.e Billboards for hotels, restaurants and special events). I think the maximize size should be 1/3 the size of the side of the semi-truck. I think the density of signs per mile should be low. Otherwise they have no effect.

If we need to have higher density of signs, then the higher density should be limited to 3 miles swaths.

I don't think a directional sign is a billboard.

Scarlett Ayres
5316 Hacienda Ave.

Christine Ochs

From: Connie Sharpe [connies@netscape.com]
Sent: Friday, March 03, 2006 11:35 AM
To: Christine Ochs
Subject: Billboards

I'm sure you don't remember, but at one time I was a member of the ETZ Commission for eight years, and during that time I chaired a committee of local citizens and enhanced a comp plan on protecting the views, which had been origfinally been paid for by the city under the direction of Jim Erickson. We paid for that plan, and we on the committee wrote an ordinance to enforce the plan. I gave a copy of it to the assistant city manager who really liked and said she would talk to Brian about it. Never heard any more! Evidently, staff does not care about the ETZ and its efforts to make this area and the city a better place to live.

I'm sure that your opinions will be acted upon. Nevertheless, I would like a copy of the "Visual Resources Corridor Plan" if you will please return to me.

Thank You!

Mrs. Connie Sharpe
526-5611

Christine Ochs

From: Terrence R. Moore
Sent: Thursday, March 02, 2006 5:51 PM
To: Christine Ochs; Robert Garza
Subject: FW: City Meeting on Improving Billboards

Christine and Robert:

FYI. Not sure if a response would even be productive at this point...

Terrence

-----Original Message-----
From: JERRY HARRELL [mailto:crucesjerry@msn.com]
Sent: Thursday, March 02, 2006 5:03 PM
To: Terrence R. Moore
Subject: City Meeting on Improving Billboards

I can see no reason the city should make any effort at all to improve billboards.

The city has absolutely no interest in better billboards.

Surely, this is something for private industry to do.

That said, obviously, this is an attempt to increase regulation of billboards. The current regulations clearly work perfectly well. There is no dramatic increase in billboard applications. There is no rush to install billboards every where. There is no reason to waste time trying to adjust a regulation which works.

Non-conforming billboards brought into the city through annexation are addressed in the current regulations.

Simply put - enough with the billboards.

Jerry Harrell

Christine Ochs

From: Jack Barclay [jbarclay@zianet.com]
Sent: Thursday, March 02, 2006 7:52 PM
To: Christine Ochs
Subject: Billboards

Dear Christine,

There are few available billboard locations left. The current code is already quite restrictive. I don't see that we need any changes in the billboard part of the sign code. As old signs come down, new ones go up, but there are just a few viable billboard locations around. I feel that it is not worth changing the sign code at this point.

The zoning for billboards is already restrictive. The billboards are interesting and it is fun to read them as one drives on our major arterial streets.

Directional and informational signs should not be treated as bill boards.

Jack Barclay
Mesilla Lodgers Tax Advisory Board

City of Las Cruces®

PEOPLE HELPING PEOPLE

Council Action Form

For Meeting of May 15, 2006
(Adoption Date)

TITLE:

AN ORDINANCE AMENDING CHAPTER 36 OF THE LAS CRUCES MUNICIPAL CODE WHICH RELATES TO SIGNS. THE AMENDMENT PROPOSES SEVERAL UPDATES TO THE CODE INCLUDING: INCORPORATING ZONING DESIGNATIONS OF THE 2001 ZONING CODE, ELIMINATING THE PROHIBITION ON SPECTACULAR SIGNS, SPECIFYING THAT THE LAND OWNER SHALL BE CONTACTED ALONG WITH THE SIGN OWNER AND MODIFYING BILLBOARD REGULATIONS.

BACKGROUND:

The Las Cruces Municipal Code, Chapter 36, addresses sign placement, design, and quantity in Las Cruces. The sign code, which was adopted in 1990, regulates real estate signs, on site monument and pole signs, wall signs, development identification signs, and billboards (off premise advertising of any size or shape).

Staff has completed a thorough review of the Code and identified several areas where updates are necessary. The attached proposal includes those updates along with the billboard prohibition. Proposed changes include making the zoning district designations consistent with the 2001 Zoning Code as recently amended and referencing the Building Code instead of the Uniform Building Code. Changes should also be made to reflect City policies which have been adopted since adoption of the Sign Code. Resolution 00-344 established that the City Manager has authority to approve permanent, but no cost easements on City land. Section 36-41.4c has been amended accordingly. By Resolution 99-212 the City Council approved a variance that allowed spectacular signs. Section 36-10.c has been amended accordingly and spectacular sign has been eliminated from the definitions. The Code frequently refers to "the owner." Amendments have been made to

(Continue on additional sheets as required)

Name of Drafter:	Department:	Phone:
Christine Ochs	Community Dev.	528-3067
Account Number	**Amount of Expenditure**	**Budget Amount**
	NA	

Strategic Plan Goal / Objective / Strategy Addressed: NA
Performance Budget Goal / Objective Addressed: Update Codes as necessary to address community growth and citizen desires.

Department	Signature	Phone	Department	Signature	Phone
Community Development	CO.	528-3066	Budget		2300
			Assistant City Manager		2271
Legal			City Manager		2076

Rev 06/05

clarify when the Code refers to the sign owner and when it refers to the land owner or both. The definition of downtown has been eliminated because it is inconsistent with uses of the term in other City documents. The commercial and industrial criteria for on-premise signs are identical so those sections have been consolidated. Language relating to business centers and overlay zones has been simplified as have the development standard tables.

As staff was working through the Code review process, a request was received to permit a sign that would direct drivers to various neighborhoods. These signs are not intended to provide any advertising but only to identify neighborhoods and direct drivers to specific neighborhoods. Directional signs are allowed on a property but may not be placed off site. The proposed sign design and location was discussed at a public meeting held March 7. General agreement was that this type of sign provides a public benefit and is attractive. A new sign category is required in order to allow this type of sign. A definition of Neighborhood Sign has been added in Section 36-3 and design criteria have been added as Section 36-89.

Based on a field inventory completed this year, there are 149 billboards in Las Cruces. Any new billboard must be permitted and reviewed by through the City. Current sign code regulations allow new billboards only along major arterials, in areas that are at least 75% nonresidential and zoned commercial or industrial. In addition, a new billboard must be located at least 1,000 feet away from any other billboard.

On February 6, 2006, a sign code amendment that prohibited any new billboards was brought before the City Council. The City Council opted not to move forward with that amendment and staff was directed to modify the amendment so as to improve billboards rather than simply ban them. A public meeting was held on March 7. Twenty-nine people attended the meeting. Input was also received via e-mails and letters.

Adopting any changes to billboard regulations will not require that any existing billboards be removed. Billboards that were legally erected prior to this code change, or under any previous code, are classified as "legal non-conforming." The sign owners are allowed to maintain the billboard and change the advertising text. Current Code does not allow for any other changes to be made to a non-conforming sign without bringing the sign into complete compliance. If a sign is too big, too tall, or too close to another sign, it will exist as is for as long as the owner can keep it standing. This amendment includes changes in Section 36-8 that would allow a nonconforming billboard to be reconstructed on the same property without losing its legal nonconforming status as long as the new sign meets size, height, configuration, **and** support requirements of the current sign code (and, to the extent possible, setback and separation requirements). This amendment will allow sign owners to improve their older signs but does not require them to do so.

Section 36-83(2) addresses what zoning districts billboards are allowed in. At the time that the sign code was written, C-2 and M-2 were the highest intensity commercial and industrial districts respectively. When C-3 and M-3 were added to the zoning code, billboards were allowed in these zones as well. Recent changes in the zoning code establish MT as the low intensity industrial zone where no billboards are allowed and M-1 is

(Continue on additional sheets as required)

now the same zone as M-2. The amendment establishes that billboards are allowed only in areas zoned C-2, C-3, M-1/M-2, or M-3.

This same section establishes that billboards are only allowed on major arterials. This includes many major arterials where no billboards are located and there is no foreseeable desire to have billboards. It does not include roadways where many existing billboards are located and will not be removed in the foreseeable future. Staff recommendation is that the sign code specify individually which roadways billboards may locate on. The list of roadways has been included in the proposed amendment. If at some future date a new roadway was established that was appropriate for billboards, the city or a private citizen cold initiate a code amendment that would add the new road to the list.

Section 36-83(b) establishes that billboards are only allowed on street segments that are at least 75% residential. There has been frequent confusion as to what constitutes a segment so the proposed amendment includes the definition. Another term which has created confusion is "radially" as used in Section 36-89(c)1. That term has been replaced with "away from any other".

The sign code specifies the minimum setback for a billboard but, at this point, there is no maximum setback. A sign company could permit a sign on a corner lot fronting a major arterial but then set the sign back so far and position it such that that it is effectively on the intersecting street. To address this loophole, a maximum setback of one third of the lot depth has been added to the code as well as a requirement that the sign be generally perpendicular to the roadway along which the sign is permitted.

City staff has been working with the public and sign companies since the fall of 2004. A work session discussion about the Sign Code was presented on February 14, 2005. A public meeting was held at Club Fusion on March 24, 2005. Approximately 10 people were in attendance at that meeting, representing sign companies, citizens affected by particular billboards, and citizens opposed to billboards in general. A "no new billboard" proposal was presented to city council as a first read on February 6, 2006 and tabled. Another public meeting was held on March 7, 2006. Approximately 29 people were at that meeting. Staff has solicited and received comments from individual citizens and businesses.

Billboards do serve a business purpose in that they are an advertising media that reaches a local audience. Whereas national firms often utilize television and radio, local firms more often rely on newspaper and signs to reach their customers. Most billboards in Las Cruces are used to advertise local items or events. Elected officials, special events, government and non-profits also use billboards to spread their messages.

Staff believes that the proposed amendment addresses the needs of the community. It provides for view protection as city roadways extend towards the mountains that make this area so unique. It encourages sign companies to enhance their out of date and sometimes obtrusive non-conforming signs. It provides for neat and orderly advertising of off site messages.

(Continue on additional sheets as required)

Discussion regarding the future of billboards in Las Cruces has been contentious. Difficult to determine if consensus has been reached. Sign Code comprehensive and billboard regulations are just a small part. Even if long term direction regarding billboards is not possible, it is important to adopt the remainder of the code changes.

SUPPORT INFORMATION:

1. Ordinance
2. Exhibit "A" Proposed changes to Chapter 36 of the Las Cruces Municipal Code, Signs.
3. Example of a Neighborhood Sign
4. Map showing location of existing billboards
5. Map showing major arterials where billboards may be allowed under current Code.
6. Map showing roadways where billboards may be allowed under proposed Code.
7. Minutes from March 7, 2006 public meeting
8. E-mails received from people who did not attend the public meeting.

COUNCIL OPTIONS:

1. Vote YES and approve the Ordinance to amend the Chapter 36 of the Las Cruces Municipal Code as proposed. This action would update portions of the Sign Code and specifically callout individual roadways where billboard could be erected if zoning, land use, and separation criteria were met.

2. Vote NO and deny the Ordinance. The Las Cruces Municipal Code would remain as is including some references being out-of-date. This action would allow for new billboards to be erected along major arterials when current zoning, land use, and separation criteria are met.

3. Modify the Ordinance and vote YES to approve the modified Ordinance. Examples of possible modifications include banning billboards all together, modifying which zoning districts the signs can be erected in, or changing the design criteria for the billboards.

4. Table/Postpone the Ordinance and direct staff accordingly.

(Continue on additional sheets as required)

City of Las Cruces

AD FORM

LAS CRUCES SUN NEWS ☒	LAS CRUCES BULLETIN ☐
CLASSIFIED LEGAL AD ☒	DISPLAY AD ☐
DATE TO PUBLISH: 04-23-06	
CITY CONTACT & PHONE#: SHIRLEY CLARK 541-2118	BILL TO: CITY CLERK P O BOX 20000 LAS CRUCES, NM 88004

PROOF OF PUBLICATION REQUIRED. PLEASE INITIAL AD FORM, AND FAX IT BACK TO 541-2117 TO INDICATE RECEIPT. *FOLLOW UP TO EMAIL.*

COPY TO PUBLISH:

Notice of Intent to Adopt

The City Council of The City of Las Cruces, New Mexico Hereby Gives Notice of Its Intent to Adopt The Following Ordinances at the Regular City Council Meeting of Monday, May 15, 2006.

1. Council Bill No. 06-094; Ordinance No. 2304 : An Ordinance Amending Chapter 36 of the Las Cruces Municipal Code Which Relates to Signs. The Amendment Proposes Several Updates to the Code Including: Incorporating Zoning Designations of the 2001 Zoning Code, Eliminating the Prohibition on Spectacular Signs, Specifying That the Land Owner Shall be Contacted Along with the Sign Owner and Modifying Billboard Regulations.

Copies Are Available for Inspection During Working Hours at the Office of the City Clerk. **Witness My Hand and Seal** of the City of Las Cruces on this the 18th day of April, 2006.

Shirley Clark

Shirley Clark, MMC
City Clerk

Notice of Intent to Adopt

The City Council of The City of Las Cruces, New Mexico Hereby Gives Notice of Its Intent to Adopt The Following Ordinances at the Regular City Council Meeting of Monday, May 15, 2006.

1. Council Bill No. 06-094; Ordinance No. 2304 : An Ordinance Amending Chapter 36 of the Las Cruces Municipal Code Which Relates to Signs. The Amendment Proposes Several Updates to the Code Including: Incorporating Zoning Designations of the 2001 Zoning Code, Eliminating the Prohibition on Spectacular Signs, Specifying That the Land Owner Shall be Contacted Along with the Sign Owner and Modifying Billboard Regulations.

Copies Are Available for Inspection During Working Hours at the Office of the City Clerk. Witness My Hand and Seal of the City of Las Cruces on this the 17th day of April, 2006.

Shirley Clark, MMC
City Clerk

PUBLISH NO. 36149
PUBLISH DATE: APRIL 23, 2006

City of Las Cruces
PEOPLE HELPING PEOPLE

AD FORM

LAS CRUCES SUN NEWS	☒	LAS CRUCES BULLETIN	☐
CLASSIFIED LEGAL AD	☒	DISPLAY AD	☐
DATE TO PUBLISH:	05-21-06		
CITY CONTACT & PHONE#: SHIRLEY CLARK 541-2118		BILL TO: CITY CLERK P O BOX 20000 LAS CRUCES, NM 88004	

PROOF OF PUBLICATION REQUIRED. PLEASE INITIAL AD FORM, AND FAX IT BACK TO 541-2117 TO INDICATE RECEIPT. *DUPLICATE OF EMAIL*

COPY TO PUBLISH:

Notice of Adoption

The City Council of The City of Las Cruces, New Mexico, Hereby Gives Notice of Its Adoption of The Following Ordinances at the Regular City Council Meeting May 15, 2006

1. Council Bill No. 06-094; Ordinance No. 2304 : An Ordinance Amending Chapter 36 of the Las Cruces Municipal Code Which Relates to Signs. The Amendment Proposes Several Updates to the Code Including: Incorporating Zoning Designations of the 2001 Zoning Code, Eliminating the Prohibition on Spectacular Signs, Specifying That the Land Owner Shall be Contacted Along with the Sign Owner and Modifying Billboard Regulations.

Copies Are Available for Inspection During Working Hours at the Office of the City Clerk. Witness My Hand and Seal of the City of Las Cruces on this the 16th day of May 2006.

Shirley Clark

Shirley Clark, MMC
City Clerk

Notice of Adoption
The City Council of The City of Las Cruces, New Mexico, Hereby Gives Notice of Its Adoption of The Following Ordinances at the Regular City Council Meeting May 15, 2006

1. Council Bill No. 06-094; Ordinance No. 2304 : An Ordinance Amending Chapter 36 of the Las Cruces Municipal Code Which Relates to Signs. The Amendment Proposes Several Updates to the Code Including: Incorporating Zoning Designations of the 2001 Zoning Code, Eliminating the Prohibition on Spectacular Signs, Specifying That the Land Owner Shall be Contacted Along with the Sign Owner and Modifying Billboard Regulations.

Copies Are Available for Inspection During Working Hours at the Office of the City Clerk. Witness My Hand and Seal of the City of Las Cruces on this the 16th day of May 2006.

Shirley Clark, MMC

City Clerk
PUB NO: 36270

Notice of Adoption
The City Council of
City of Las Cruces, N
Mexico, Hereby Gi
Notice of this Adopt
of The Following O
nances at the Regu
City Council Meeti
May 15, 2006.
Council Bill No. 06-0
Ordinance No. 2304:
Ordinance Amendi
Chapter 36 of the
Cruces Municipal Co
Which Relates to Sig
The Amending Propo
Several Updates to t
Code Including; Incor
rating Zoning Desig
tions of the 2001 Zoni
Code. Eliminating t
Prohibition on Specta
lar Signs, Specifying T
the Land Owner Shall
Contacted Along wi
the Sign Owner and
difying Billboard Regu
tions.

Copies Are Available t
Inspection During Wo
ing Hours at the Offi
of the City Clerk, Witne
My Hand and Seal of t
City of Las Cruces on t
the 16th day of M
2006.

Shirley Clark, MMC
City Clerk

Pub. No. 36339
Pub. Date 05/21/06

ATTACHMENT “E-1”

USDOT FHWA 7/17/1996 Memo

Memorandum

U.S. Department of Transportation
Federal Highway Administration

Subject: INFORMATION: Off-Premise Changeable Message Signs

Date: JUL 17 1996

Director, Office of Real Estate Services

Reply to Attn. of: HRE-20

To:

Regional Administrators

A number of States are taking the position that certain off-premise changeable message signs are consistent with State law and do not violate the lighting provisions of their State/Federal agreement. The State of Georgia recently amended its State law to allow off-premise signs having panels or slats that rotate provided they meet State criteria for frequency of message change and spacing. The State of Oklahoma recently considered amending its State law to also allow these signs. Because of the increased use of changeable message signs, we believe it is timely to restate our position concerning these signs.

The Federal Highway Administration (FHWA) has always applied the Federal law 23 U.S.C. 131 as it is interpreted and implemented under the Federal regulations and individual State/Federal agreements. Because there is considerable variation among the States, the importance of these agreements cannot be overstated. In the twenty-odd years since the agreements have been signed, there have been many technological changes in signs, including changes that were unforeseen at the time the agreements were executed. While most of the agreements have not changed, the changes in technology require the State and FHWA to interpret the agreements with those changes in mind. Changeable message signs are acceptable for off-premise signs, regardless of the type of technology used, if the interpretation of the State/Federal agreement allows such signs. In nearly all States, these signs may still not contain flashing, intermittent, or moving lights.

The FHWA will concur with a State that can reasonably interpret the State/Federal agreement to allow changeable message signs if such interpretation is consistent with State law. The frequency of message change and limitation in spacing for these signs should be determined by the State. This interpretation is limited to conforming signs, as applying updated technology to nonconforming signs would be considered a substantial change and inconsistent with 23 CFR 750.707(d)(5).

Barbara K. Orski

Barbara K. Orski

FHWA:HRE-20:RPHarter:gs:62026:June 24, 1996
cc: Reader Chron HRE-20
G:\12\RPH\CMS.110

Texas Department of Transportation

P.O. BOX 5075 • AUSTIN, TEXAS 78763-5075 • (512) 416-2901

March 10, 2006

RECEIVED
MAR 13 2006
TEXAS DIV
FHWA

Robert M. Callan
Acting Division Director
Federal Highway Administration – Texas Division
300 East Eighth Street, Room 826
Austin, Texas 78701

Dear Mr. Callan:

Recently, outdoor advertising providers have approached the Texas Department of Transportation ("TxDOT") regarding the use of light-emitting diode ("LED") displays on Interstate and Federal-Aid highways. The 1972 Federal-State Agreement ("Agreement") executed by the Federal Highway Administration ("FHWA") and TxDOT states in pertinent part:

> F. Lighting: Signs may be illuminated, subject to the following restrictions:
>
> 1. Signs which contain, include or are illuminated by any flashing, intermittent or moving light or lights are prohibited...

Since the technology necessary for LED displays did not exist at the time of the Agreement, TxDOT requests guidance from the FHWA regarding whether the use of such displays violate the Agreement. Should you be unfamiliar with this technology, an outdoor advertising company has provided a DVD on such displays which I will be glad to forward to you.

Should the FHWA determine that such displays currently violate the Agreement, TxDOT is considering applying to the FHWA to amend the Agreement. In your response to the above, could you provide an outline of the steps necessary for such an amendment?

Thank you for your assistance. If you have any questions, please do not hesitate to contact me at (512) 416-2926.

Sincerely,

Timothy C. Anderson

Timothy C. Anderson, Esq.
Right Of Way Division
Texas Department of Transportation

08/17/2006 03:24 5124162939 ROW LEGAL TXDOT PAGE 04/06

U.S. Department of Transportation
Federal Highway Administration

J.J. Pickle Federal Building
300 E. 8th Street, Room 826
Austin, Texas 78701

March 15, 2006

In Reply Refer To: HPP-TX

LED Displays
Texas Federal/State Agreement

Mr. Timothy C. Anderson, Esq.
Right of Way Division
Texas Department of Transportation.
P.O. Box 5075
Austin, Texas 78701

Dear: Mr. Anderson:

This letter is in response to your letter dated March 10, 2006 requesting guidance from FHWA regarding the use of light-emitting diode (LED) displays on Interstate and Federal-Aid highways in Texas. In particular your letter requested FHWA's determination whether the use of this type of display is in violation of the 1972 Federal-State Agreement executed by the Federal Highway Administration and TxDOT.

The Highway Beautification Act (HBA) directs the US Secretary of Transportation to enter into agreements with each State to determine the limits or specifications for size, spacing and lighting of outdoor advertising signs in commercial and industrial areas (see 23 U.S.C. § 131(d)). These agreed-upon limits were supposed to be "consistent with customary use" within the State.

The Texas/ Federal Agreement executed pursuant to §131(d) on May 2, 1972, prohibits signs which contain, include or are "illuminated by any flashing, intermittent or moving light or lights.... except those giving public service information such as time, date, temperature, weather or similar information." The State has always abided by the terms of the agreement. As you are aware, the Texas Administrative Code, Rule 21.154, addresses lighting and movement of signs. Section 21.154 (a) (1) states; Signs may be illuminated except for signs that contain, include, or are illuminated by any flashing, intermittent, or moving light or lights, including any type of screen using animated or scrolling displays, such as LED (light emitting diode) screen or any other type of video display, even if the message is stationary, except those giving only public service information such as time, date, temperature, weather, or similar information.

While the technology for LED displays did not exist at the time of the agreement, the wording in the agreement clearly prohibits such signs. After careful consideration and review of your request for guidance, the FHWA Texas Division has determined that such displays do not conform to the existing Texas/ Federal Agreement.

Celebrating 50 Years 1956 2006 50 Eisenhower Interstate System

BUCKLE UP AMERICA

Timothy C. Anderson, Esq. March 15, 2005

As you requested, outlined below is the process to amend a Federal-State Agreement:

1. A State must first submit its proposed change, along with the reasons for the change and the effects of such change, to the FHWA Division Office.
2. The Division and FHWA headquarters offices review and comment on the proposal.
3. If the concept is approved by the FHWA, the State must hold statewide public hearings on the proposed change in order to receive comments from the public.
4. If the State then, wishes to amend the agreement, it must submit to the FHWA:
   a. The justification for the change
   b. The record of hearings and
   c. An assessment of the impact.
5. Then, these are summarized and published in the Federal Register for comments
6. Comments on the proposed amended agreement will then be evaluated by the FHWA.
7. The FHWA will then decide if the agreement should be amended as proposed and will publish its decision in the Federal Register.

The FHWA would certainly entertain a request by a State to amend the State/Federal agreement pertaining to §131(d) signs, but the FHWA would have to determine if a proposed change was consistent with the HBA and its implementing regulations found at 23 CFR Part 750. In the past fifteen years, there have been amended agreements with two States, Nevada and Oregon. As you can see, it is not a common practice.

I hope that this letter clearly sets forth the FHWA's position on the matter.

Sincerely,

Robert M. Callan
Acting Division Administrator

ATTACHMENT "E-2"

USDOT FHWA 9/25/2007 Memo

Memorandum

U.S. Department of Transportation
Federal Highway Administration

Subject: **INFORMATION:** Guidance on Off-Premise Changeable Message Signs

Date: September 25, 2007

In Reply Refer To: HEPR -20

From: Original signed by:
Gloria M. Shepherd
Associate Administrator for
Planning, Environment, and Realty

To: Division Administrators
Attn: Division Realty Professionals

Purpose

The purpose of this memorandum is to provide guidance to Division offices concerning off-premises changeable message signs adjacent to routes subject to requirements for effective control under the Highway Beautification Act (HBA) codified at 23 U.S.C. 131. It clarifies the application of the Federal Highway Administration (FHWA) July 17, 1996 memorandum on this subject. This office may provide further guidance in the future as a result of additional information received through safety research, stakeholder input, and other sources.

Pursuant to 23 CFR 750.705, a State DOT is required to obtain FHWA Division approval of any changes to its laws, regulations, and procedures to implement the requirements of its outdoor advertising control program. A State DOT should request and Division offices should provide a determination as to whether the State should allow off-premises changeable electronic variable message signs (CEVMS) adjacent to controlled routes, as required by our delegation of responsibilities under 23 CFR 750.705(j). Those Divisions that already have formally approved CEVMS use on HBA controlled routes, as well as those that have not yet issued a decision, should re-evaluate their position in light of the following considerations. The decision of the Division should be based upon a review and approval of a State's affirmation and policy that: (1) is consistent with the existing Federal/State Agreement (FSA) for the particular State, and (2) includes but is not limited to consideration of requirements associated with the duration of message, transition time, brightness, spacing, and location, submitted for FHWA approval, that evidence reasonable and safe standards to regulate such signs are in place for the protection of the motoring public. **Proposed laws, regulations, and procedures that would allow permitting CEVMS subject to acceptable criteria (as described below) do not violate a prohibition against "intermittent" or "flashing" or "moving" lights as those terms are used in the various FSAs that have been entered into during the 1960s and 1970s.**

This Guidance is applicable to conforming signs, as applying updated technology to nonconforming signs would be considered a substantial change and inconsistent with the requirements of 23 CFR 750.707(d)(5). As noted below, all of the requirements in the HBA and its implementing regulations, and the specific provisions of the FSAs, continue to apply.

Background

The HBA requires States to maintain effective control of outdoor advertising adjacent to certain controlled routes. The reasonable, orderly and effective display of outdoor advertising is permitted in zoned or unzoned commercial or industrial areas. Signs displays and devices whose size, lighting and spacing are consistent with customary use determined by agreement between the several States and the Secretary, may be erected and maintained in these areas (23 U.S.C. § 131(d)). Most of these agreements between the States and the Secretary that determined the size, lighting and spacing of conforming signs were signed in the late 1960's and the early 1970's.

On July 17, 1996, this Office issued a Memorandum to Regional Administrators to provide guidance on off-premise changeable message signs and confirmed that FHWA has "always applied the Federal law 23 U.S.C. 131 as it is interpreted and implemented under the Federal regulations and individual Federal/State agreements.". It was expressly noted that "in the twenty-odd years since the agreements have been signed, there have been many technological changes in signs, including changes that were unforeseen at the time the agreements were executed. While most of the agreements have not changed, the changes in technology require the State and FHWA to interpret the agreements with those changes in mind". The 1996 Memorandum primarily addressed tri-vision signs, which were the leading technology at the time, but it specifically noted that changeable message signs "regardless of the type of technology used" are permitted if the interpretation of the FSA allowed them. Further advances in technology and affordability of LED and other complex electronic message signs, unanticipated at the time the FSAs were entered into, require the FHWA to confirm and expand on the principles set forth in the 1996 Memorandum.

The policy espoused in the 1996 Memorandum was premised upon the concept that changeable messages that were fixed for a reasonable time period do not constitute a moving sign. If the State set a reasonable time period, the agreed-upon prohibition against moving signs is not violated. Electronic signs that have stationary messages for a reasonably fixed time merit the same considerations.

Discussion

Changeable message signs, including Digital/LED Display CEVMS, are acceptable for conforming off-premise signs, if found to be consistent with the FSA and with acceptable and approved State regulations, policies and procedures.

This Guidance does not prohibit States from adopting more restrictive requirements for permitting CEVMS to the extent those requirements are not inconsistent with the HBA, Federal regulations, and existing FSAs. Similarly, Divisions are not required to concur with State proposed regulations, policies, and procedures if the Division review determines, based upon all relevant information, that the proposed regulations, policies and procedures are not consistent with the FSA or do not include adequate standards to address the safety of the motoring public. If the Division Office has any question that the FSA is being fully complied with, this should be discussed with the State and a process to change the FSA may be considered and completed before such CEVMS may be allowed on HBA controlled routes. The Office of Real Estate Services is available to discuss this process with the Division, if requested.

If the Division accepts the State's assertions that their FSA permits CEVMS, in reviewing State-proposed regulations, policy and procedures for acceptability, Divisions should consider all relevant information, including but not limited to duration of message, transition time, brightness, spacing, and location, to ensure that they are consistent with their FSA and that there are adequate standards to address safety for the motoring public. Divisions should also confirm that the State provided for appropriate public input, consistent with applicable State law and requirements, in its interpretation of the terms of their FSA as allowing CEVMS in accordance with their proposed regulations, policies, and procedures.

Based upon contacts with all Divisions, we have identified certain ranges of acceptability that have been adopted in those States that do allow CEVMS that will be useful in reviewing State proposals on this topic. Available information indicates that State regulations, policy and procedures that have been approved by Divisions to date, contain some or all of the following standards:

- Duration of Message
  - Duration of each display is generally between 4 and 10 seconds – 8 seconds is recommended.
- Transition Time
  - Transition between messages is generally between 1 and 4 seconds – 1-2 seconds is recommended.
- Brightness
  - Adjust brightness in response to changes in light levels so that the signs are not unreasonably bright for the safety of the motoring public.
- Spacing
  - Spacing between such signs not less than minimum spacing requirements for signs under the FSA, or greater if determined appropriate to ensure the safety of the motoring public.
- Locations
  - Locations where allowed for signs under the FSA except such locations where determined inappropriate to ensure safety of the motoring public.

Other standards that States have found helpful to ensure driver safety include a default designed to freeze a display in one still position if a malfunction occurs; a process for modifying displays and lighting levels where directed by the State DOT to assure safety of the motoring public; and requirements that a display contain static messages without movement such as animation, flashing, scrolling, intermittent or full-motion video.

Conclusion

This Memorandum is intended to provide information to assist the Divisions in evaluating proposals and to achieve national consistency given the variations in FSAs, State law, and State regulations, policies and procedures. It is not intended to amend applicable legal requirements. Divisions are strongly encouraged to work with their State in its review of their existing FSAs and, if appropriate, assist in pursuing amendments to address proposed changes relating to CEVMS or other matters. In this regard, our Office is currently reviewing the process for amending FSAs, as established in 1980, to determine appropriate revisions to streamline requirements while continuing to ensure there is adequate opportunity for public involvement.

For further information, please contact your Office of Real Estate Point of Contact or Catherine O'Hara (Catherine.O'Hara@dot.gov).

ATTACHMENT “F”

67-12-1-15 NMSA1978

ARTICLE 12
Highway Beautification

Section

67-12-1 Short title.
67-12-2 Definitions.
67-12-3 Public policy.
67-12-4 Outdoor advertising prohibited; exceptions.
67-12-5 Outdoor advertising; regulations; permits.
67-12-6 Outdoor advertising; acquisition; compensation; removal.
67-12-7 Outdoor advertising; safety rest areas; information centers.
67-12-8 Leases, franchises or concessions to individuals for private commercial operation of tourist information centers prohibited; penalty.
67-12-9 Junkyards; license required.
67-12-10 Junkyards; screening; acquisition; removal; compensation.
67-12-11 Junkyards; abatement of nuisance.
67-12-12 Powers of commission.
67-12-13 Construction of act.
67-12-14 Acquisition of land for scenic beauty.
67-12-15 Tree plantings along medians and public rights-of-way.

67-12-1. Short title.

This act [67-12-1 to 67-12-14 NMSA 1978] may be cited as the "Highway Beautification Act."

67-12-2. Definitions.

As used in the Highway Beautification Act [67-12-1 NMSA 1978]:

A. "interstate system" means that portion of the national system of interstate and defense highways located within this state as may now or hereafter be officially so designated by the commission and approved pursuant to Title 23, United States Code;

B. "primary system" means that portion of connected main highways located within this state as may now or hereafter be officially so designated by the commission and approved pursuant to Title 23, United States Code;

C. "commission" means the state transportation commission;

D. "outdoor advertising" means any outdoor sign, display, light, device, figure, painting, drawing, message, plaque, poster, billboard or other object that is designed, intended or used to advertise or inform, any part of which is located within six hundred sixty feet of the nearest edge of the right of way and is visible from the main-traveled way of the interstate or primary systems or those located beyond six hundred sixty feet of the right of way, located outside of urban areas, visible from the main-traveled way of the system and erected with the purpose of their message being read from such main-traveled way;

E. "safety rest area" means a site established and maintained by or under public supervision or control for the convenience of the traveling public within or adjacent to the right of way of the interstate or primary systems;

F. "information center" means a site established and maintained at a safety rest area for the purpose of informing the public of places of interest within the state and providing other information the commission considers desirable;

G. "junk" means old or scrap copper, brass, rope, rags, batteries, paper, trash, rubber, debris, waste or junked, dismantled or wrecked automobiles or parts thereof, iron, steel and other old or scrap ferrous or nonferrous material;

H. "automobile graveyard" means any establishment or place of business maintained, used or operated for storing, keeping, buying or selling wrecked, scrapped, ruined or dismantled motor vehicles or motor vehicle parts;

I. "junkyard" means any establishment or place of business maintained, used or operated for storing, keeping, buying or selling junk or for the maintenance or operation of an automobile graveyard, any portion of which is located within one thousand feet of the nearest edge of the right of way of the interstate or primary systems, and it includes garbage dumps and sanitary fills; and

J. "urban area" means an area including and adjacent to a municipality or other urban place having a population of five thousand or more, as determined by the latest available federal census, within boundaries to be fixed by the commission, subject to any necessary approval by any federal agency, department or personnel.

67-12-3. Public policy.

In order to promote public safety, health, welfare, convenience and enjoyment of public travel, to protect the public investment in public highways and to preserve and enhance the scenic beauty of lands bordering public highways, it is the public policy of this state to regulate the erection and maintenance of outdoor advertising and the establishment, operation and maintenance of junkyards in areas adjacent to the interstate and primary systems in accordance with the Highway Beautification Act [67-12-1 NMSA 1978]. The legislature finds that regulation of outdoor advertising and junkyards is for a highway purpose.

67-12-4. Outdoor advertising prohibited; exceptions.

A. Outdoor advertising shall not be erected or maintained except:

(1) directional and other official signs and notices authorized or required by law, including, but not limited to, signs and notices pertaining to houses of worship, natural wonders and scenic and historic attractions;

(2) signs, displays and devices advertising the sale or lease of property upon which they are located;

(3) signs, displays and devices advertising activities conducted on the property upon which they are located, provided that the bisection of a parcel of land by a highway right-of-way acquisition shall not in itself be construed as converting the property into more than one parcel;

(4) signs, displays and devices located in areas which are zoned as industrial or commercial under authority of law;

(5) signs, displays and devices located within six hundred sixty feet of the nearest edge of the right of way, in unzoned industrial or commercial areas as defined by regulations promulgated by the commission, provided that no area shall be considered to be an unzoned commercial or industrial area unless and until a regulation defining the area as unzoned commercial or industrial is promulgated by the commission; and

(6) signs lawfully in existence on October 22, 1965, determined by the commission, subject to any necessary federal approval, to be landmark signs of historic or artistic significance worthy of preservation including signs on farm structures or natural surfaces.

B. All outdoor advertising shall conform with standards and specifications, shall bear permits and have paid therefor permit fees, as required by the Highway Beautification Act [67-12-1 NMSA 1978] and regulations promulgated pursuant thereto or authorized thereby, except that permits shall not be required or fees paid for outdoor advertising included in Paragraphs (1), (2) and (3) of Subsection A of this section.

C. Notwithstanding this section, any outdoor advertising that was lawfully in existence on the effective date of the Highway Beautification Act and has continued to so exist may remain in place until the outdoor advertising is acquired by the commission or condemnation in relation thereto is commenced by the commission, whichever first occurs, but only if and so long as all provisions of Subsection B of this section are complied with.

67-12-5. Outdoor advertising; regulations; permits.

A. The commission may promulgate regulations concerning:

(1) the definition of unzoned industrial or commercial areas adjacent to the interstate and primary systems;

(2) the removal of outdoor advertising so required or authorized under the Highway Beautification Act [67-12-1 NMSA 1978];

(3) permits for the erection and maintenance of outdoor advertising; and

(4) standards and specifications pertaining to outdoor advertising, including, but not limited to, construction, maintenance, spacing, lighting, size and location.

B. Regulations promulgated by the commission under this section shall be consistent with the public policy of this state as declared in the Highway Beautification Act and national standards promulgated pursuant to Title 23, United States Code.

C. The commission shall establish and collect uniform fees for the issuance of permits for outdoor advertising. The fees shall not be more than the actual cost to the commission of enforcement and administration of this act, or five dollars ($5.00) per year, whichever is greater, for each sign, display and device. All fees so collected shall be paid to the state treasurer for credit to the state road fund.

D. Any permit fee payable for the years 1966 through 1971 inclusive shall be deemed timely paid if, but only if, the fee is received by the commission prior to July 1, 1971. For the year 1972 and every year thereafter, the permit fee shall be deemed timely paid if, said fee is received by the commission on or before the first day of the year for which said fee is being paid. Failure of timely payment of the permit fee for any outdoor advertising except those included in Subsections A (1), A (2) and A (3) of Section 67-12-4 NMSA 1978 shall render the outdoor advertising subject to removal by the commission without any compensation whatsoever and at the expense of the owner of the outdoor advertising.

67-12-6. Outdoor advertising; acquisition; compensation; removal.

A. The commission may acquire by agreement or condemnation all outdoor advertising and property rights pertaining thereto. The commission may so remove the outdoor advertising if at the time of the acquisition:

(1) the outdoor advertising bears the requisite permit, if any;

(2) the owner of the outdoor advertising has timely paid all permit fees, past and present, if any, required in connection with the erection and maintenance thereof;

(3) the outdoor advertising conforms with standards, specifications and requirements contained in regulations promulgated by the commission; and

(4) the outdoor advertising was lawfully in existence on the effective date of the Highway Beautification Act and has continued to so exist, or was lawfully erected subsequent to the effective date. For the purpose of this paragraph, any outdoor advertising in existence on or after November 6, 1978, that was erected prior to November 18, 1971 under any permit or conditional permit issued by the state highway department shall be considered to be lawfully erected. For all purposes the effective date of the New Mexico Highway Beautification Act shall be March 15, 1971.

The condemnation shall be exercised by eminent domain in the manner provided by law, and each interested party shall have the right to a separate trial as to the respective interests involved.

B. Whenever outdoor advertising and property rights pertaining thereto are acquired by the commission pursuant to Subsection A of this section:

(1) the owner of the outdoor advertising shall be paid just compensation by the commission equal to the fair market value of the outdoor advertising which is to be deemed a trade fixture; and

(2) the owner of the land upon which the outdoor advertising is located shall be paid just compensation equal to the value of his right to have the outdoor advertising erected and maintained on the land.

C. The right to compensation as provided in Subsection B of this section shall not be affected solely by the failure of any outdoor advertising to conform to standards, specifications and requirements contained in regulations promulgated by the commission relating to any subject other than permits or permit fees unless the commission has given notice by certified mail to the owner of the land upon which the outdoor advertising is located, and to the owner of the outdoor advertising if his name appears thereon, advising of the failure to conform and ordering that the outdoor advertising be made to so conform or be removed within thirty days from the date of such notice. If the failure to conform is corrected within the thirty days, then the failure to conform shall be deemed cured for all purposes; if, however, the defect is not corrected within the thirty days, the commission may thereafter remove the outdoor advertising at the expense of the owner of the outdoor advertising without any compensation whatsoever. This subsection specifically does not apply in any manner to permit fees, and no notice whatsoever shall be required in connection with the permit fees.

D. Compensation shall not include any element of damages which is not subject to federal aid participation under the federal Highway Beautification Act of 1965, as has been or may be hereafter amended or superseded, or otherwise.

E. In any case where outdoor advertising has been removed under the Highway Beautification Act [67-12-1 NMSA 1978], and the removal is compensable under that act, but the commission has not paid just compensation or instituted condemnation proceedings therefor, the owner of the outdoor advertising, or the owner of the land upon which it is located, or both, may bring actions against the

67-12-7. Outdoor advertising; safety rest areas; information centers.

In order to provide information in the specific interest of the traveling public, the commission may authorize outdoor advertising at safety rest areas and at information centers.

commission as provided in Section 42-1-23 NMSA 1978, for recovery of such compensation.

F. All outdoor advertising other than that meeting all the requirements of Subsection A of this section is declared to be a public nuisance and in contravention of law. Therefore and otherwise, the commission may remove or cause the removal of all outdoor advertising other than that meeting all the requirements of Subsection A of this section which removal shall be without any compensation whatsoever and at the expense of the owner of the outdoor advertising.

G. Removal of outdoor advertising by or at the request of the commission, its agents or employees in compliance with the Highway Beautification Act does not subject such removal or the persons performing it to criminal prosecution or give rise to any liability to any person or entity for the injury, loss or destruction of any property which occurs in connection with the removal.

67-12-12. Powers of commission.

The commission may:

A. promulgate regulations it deems necessary to implement and enforce the Highway Beautification Act [67-12-1 NMSA 1978]; and

B. enter into agreements with the secretary of commerce pursuant to Title 23, United States Code, relating to the control of outdoor advertising and junkyards in areas adjacent to the interstate and primary systems, and to take action in the name of the state to comply with the terms of the agreements.

67-12-13. Construction of act.

Nothing in the Highway Beautification Act [67-12-1 NMSA 1978] affects the provisions of any lawful ordinance or regulation which is more restrictive than the Highway Beautification Act.

ATTACHMENT "G"

NMDOT Outdoor Advertising Requirements

This rule was filed as: 18 NMAC 21.5

TITLE 18 TRANSPORTATION AND HIGHWAYS
CHAPTER 21 TRAFFIC CONTROL SIGNAGE
PART 5 OUTDOOR ADVERTISING REQUIREMENTS

18.21.5.1 ISSUING AGENCY: New Mexico State Highway and Transportation Department P. O. Box 1149 Santa Fe, New Mexico 87504-1149 (505) 827-5460
[10/31/98; 18.21.5.1 NMAC – Rn, 18 NMAC 21.5.1, Recompiled 11/16/01]

18.21.5.2 SCOPE: All state agencies and the general public.
[10/31/98; 18.21.5.2 NMAC – Rn, 18 NMAC 21.5.2, Recompiled 11/16/01]

18.21.5.3 STATUTORY AUTHORITY: NMSA 1978, Sections 67-12-1 et. seq., as amended; and NMSA 1978, Sections 67-3-11 and 67-3-14, as amended.
[10/31/98; 18.21.5.3 NMAC – Rn, 18 NMAC 21.5.3, Recompiled 11/16/01]

18.21.5.4 DURATION: Permanent.
[10/31/98; 18.21.5.4 NMAC – Rn, 18 NMAC 21.5.4, Recompiled 11/16/01]

18.21.5.5 EFFECTIVE DATE: October 31, 1998, unless a later date is cited at the end of a section or paragraph.
[10/31/98; 18.21.5.5 NMAC – Rn, 18 NMAC 21.5.5, Recompiled 11/16/01]

18.21.5.6 OBJECTIVE: Implement and enforce the New Mexico Highway Beautification Act.
[10/31/98; 18.21.5.6 NMAC – Rn, 18 NMAC 21.5.6, Recompiled 11/16/01]

18.21.5.7 DEFINITIONS:

A. "Abandoned Sign" means any outdoor advertising device that (1) no longer has active copy for a period of one year, and (2) no longer has a lease for the site in which it is located.

B. "Beautification Act" means NMSA 1978 Section 67-12-1 et. seq., as amended.

C. "Bona Fide Business Activity" means a commercial or industrial activity which is carried on for profit and which operates for at least six (6) continuous months of the year and with a valid twelve (12) month business license issued by a city, county, or state whether or not a permanent structure is located thereon.

D. "Centerline of Highway" means a line equidistant from the edges of the median separating the main-traveled way of a divided highway separated by more than the normal median width or constructed on independent alignment.

E. "Commercial or Industrial Activities" means those activities generally recognized as commercial or industrial by zoning authorities in New Mexico, except that none of the following shall be considered commercial or industrial activities:

(1) Outdoor advertising structures.

(2) Agricultural, forestry, ranching, grazing, farming, and related activities, including, but not limited to, wayside fresh produce stands.

(3) Transient or temporary activities.

(4) Activities not visible from the main-traveled way.

(5) Activities conducted in a building principally used as a residence.

(6) Railroad track and minor sidings and supporting building and fixtures; except for depots open to the public at least six (6) hours-per day.

(7) Activities located in their entirety more than 660 feet from the nearest edge of the right of way line outside urban areas.

(8) Feeder pens and dairy activities, including sale of diary products on the premises upon which they are produced.

(9) Camping or overnight parking unless such facilities are equipped with adequate parking accommodations, modern sanitary facilities and drinking water. Establishment must be licensed or approved by appropriate governmental agency.

F. "Commission" means the State Highway Commission.

G. "Customary Maintenance" means the usual state of maintaining a sign in order to keep it in a good state of repair while not changing the general structure of non-conforming signs significantly. This would include painting, replacement of a damaged panel, or a rotten pole, etc.

H. "Department" means the New Mexico State Highway and Transportation Department.

I. "Directional Signs" means signs containing directional information about public places owned or operated by federal, state or local governments or their agencies; publicly or privately owned natural phenomena, historic, cultural, scientific, education, and religious sites; and areas of natural scenic beauty or naturally suited for outdoor recreation, deemed to be in the interest of the traveling public.

J. "Erect" means to construct, build, raise, assemble, place, affix, attach, create, paint, draw, or in any other way establish or bring into being.

K. "Facing" means the number of surfaces on a sign.

L. "Information Center" means a site established and maintained within right-of-way for the purpose of informing the public of places of interest within the state and providing other information the Commission considers desirable.

M. "Interstate System" means that portion of the national system or interstate and defense highways located within this state as may now or hereafter be officially so designated by the Commission and approved pursuant to Title 23, United State Code.

N. "Lease" means any agreement, whether oral or written, by which one such party or his agent gives to another party for consideration, the right to erect or maintain an outdoor advertising device on the land or one of the parties or their principal.

O. "Legible" means capable of being read without visual aid by a person of normal visual acuity.

P. "Maintain" means to allow to exist.

Q. "Main-traveled" means the traveled way of a highway on which through traffic is carried. In the case of a divided highway, the traveled way of each of the separated roadways for traffic in opposite directions is a main-traveled way. It does not include such facilities as frontage roads, turning roadways, or parking areas.

R. "Official Signs and Notices" means signs and notices erected and maintained by public officers or public agencies within their territorial or zoning jurisdiction and pursuant to and in accordance with direction of authorization contained in federal, state or local law for the purpose of carrying out an official duty or responsibility. Historical markers authorized by law and erected by state or local government agencies or non-profit historical societies shall be considered official signs.

S. "On-premise sign" means sign, which advertises activities, conducted on the property upon which the sign is located; and is located within the area actually utilized for the purpose of the activity it advertises.

T. "Outdoor Advertising Device" means any surface and supporting structure, visible from the main-traveled way of the interstate or primary system, and used or intended to be used to advertise or inform. This may be a display, light, device, figure, painting, drawing, message, plague, structure, or object may support multiple surfaces, and if so, each surface shall be considered a separate outdoor advertising facing. Any structure used or intended to be used to support such a surface as just described is included.

U. "Primary System" means that portion of connected main highways located within this state as may now or hereinafter be officially so designated by the Commission and approved pursuant to Title 23, United States Code.

V. "Public Service Signs" means signs located on school bus stop shelters, signs which;

(1) identify the donor, sponsor, or contributor of said shelters;

(2) contain public service messages which shall occupy at least 50 percent of the area of the sign;

(3) contain no other message;

(4) are located on school bus shelters which are authorized or approved by city, county, or state law, regulation or ordinance and at places approved by the city, county, or state agency controlling the highway involved; and

(5) may not exceed 32 square feet in area. Not more than one sign on each shelter shall face in any one direction.

W. "Public Utility Signs" means warning signs, informational signs, notices, or markers, which are customarily erected and maintained by publicly or privately owned public utilities, as essential to their operations but is not advertising a product.

X. "Ranch/Farm, Service Club and Religious Notices" mean signs and notices which do not exceed thirty-two (32) square feet, which are erected and authorized by law, and which relate to the name of Ranch/Farm and directions to it, meetings of non-profit service clubs and charitable associations or religious services.

Y. "Safety Rest Area" means a site established and maintained by or under public supervision or control for the convenience of the traveling public within or adjacent to the right of way of the interstate or primary system.

Z. "Sign" means any outdoor advertising device as defined in paragraph 7.20

AA. "State Law" means a state constitutional provision or statute, or an ordinance, rule, or regulations enacted or adopted by a state agency or political subdivision of a state pursuant to the state constitution or to a state statute.

AB. "Unzoned Area" means an area, which has not been zoned by a properly constituted zoning authority according to legally prescribed procedure.

AC. "Unzoned Commercial or Industrial Area" means unzoned lands upon which there is located a bona fide commercial or industrial activity operating for at least six (6) continuous months of the year with a valid 12 months business license issued by a city, county or the state, whether or not a permanent structure is located thereon, and the area along the highway extending outward 1,000 feet from and beyond the edge of such commercial or industrial activity and extending perpendicular from the centerline to a depth of 660 feet from the nearest edge of the right-of-way line on the same side of the highway as the commercial or industrial activity.

AD. "Urban Area" means an urbanized area or, in the case of an urbanized area encompassing more than one state, that part of the urbanized area in each such state, or in urban place as designed by the Bureau of the Census having a population of 5,000 or more and not within any urbanized area, within boundaries to be fixed by responsible state and local officials in cooperation with each other, subject to approval by the Federal Secretary of Transportation. Such boundaries shall, as a minimum, encompass the entire urban place designated by the Bureau of Census.

AE. "Urbanized Area" means an area so designated by the Bureau of the Census, within boundaries to be fixed by responsible state and local officials in cooperation with each other, subject to approval by the Federal Secretary of Transportation. Such boundaries shall, as a minimum, encompass the entire urbanized area within a state as designated by the Bureau of Census.

AF. "Visible" means capable of being seen (whether or not legible) without visual aid by a person of normal visual acuity, except that within urban areas "visible" means within 660 feet of the nearest edge of the right-of-way line.

AG. "Zoned Industrial or Commercial Area" means area which is reserved for business, commerce, trade, manufacturing, or industry, pursuant to a validly promulgated state or local ordinance or regulation.
[10/31/98; 18.21.5.7 NMAC – Rn, 18 NMAC 21.5.7, Recompiled 11/16/01]

18.21.5.8 CLASSES OF SIGNS ALLOWED: No outdoor advertising devices shall be erected or maintained except:

A. Directional and other official signs and notices.

B. Signs, displays, and devices advertising the sale or lease of specific properties upon which they are located.

C. On premise signs.

D. Signs, displays, and devices located within 660 feet of the nearest edge of the right-of-way, which are zoned as industrial or commercial under authority of law.

E. Signs, displays, and devices located within 660 feet of the nearest edge of the right-of-way in unzoned industrial or commercial areas.

F. Signs lawfully in existence on October 22, 1965, determined by the Commission, subject to any necessary federal approval, to be landmark signs of historic or artistic significance worthy of preservation including signs on farm structures or natural surfaces, and which have been permitted under Section 27 [18.21.27 NMAC].

G. Signs lawfully in existence on the effective date of the Highway Beautification Act and which are continuing to exist and currently permitted under Section 27 [18.21.27 NMAC].
[10/31/98; 18.21.5.8 NMAC – Rn, 18 NMAC 21.5.8, Recompiled 11/16/01]

18.21.5.9 RECLASSIFICATION OF HIGHWAYS:

A. Any sign lawfully erected along a highway which is not part of the interstate or primary system at the time of the sign's erection and which sign becomes subject to the provisions of the Beautification Act and this rule due to the reclassification of the highway as a primary highway, will remain a legal and compensable sign so long as all permits for the sign are timely obtained and all permit fees timely paid. Failure to timely obtain permits and timely pay permit fees will, however, render such a sign illegal and non-compensable and subject to removal by the Department at the expense of the sign owner.

B. Permits and permit fees for the class of signs described in this section are timely obtained and timely paid if obtained and timely paid for the next calendar year following the reclassification, and following notification to the sign owner of the reclassification by the Department.
[10/31/98; 18.21.5.9 NMAC – Rn, 18 NMAC 21.5.9, Recompiled 11/16/01]

18.21.5.10 SIGNS PROHIBITED: No sign may be erected or maintained which:

A. Physically intrudes upon the right-of-way or by being of such a distracting nature so as to dangerously divert driver's attention from the roadway.

B. Attempts or appears to attempt to direct the movement of traffic or which interferes with, imitates or resembles any official traffic sign, signal or device.

C. Prevents the driver of a vehicle from having a clear and unobstructed view of pre-existing official signs and approaching or merging traffic.

D. Contains, includes, or is illuminated by any flashing, intermittent or moving light or lights.

E. Is lighted in any way unless the lighting is so effectively shielded as to prevent beams or rays of light from being directed at any potion of the main-traveled way of the interstate or primary systems, or is of such low intensity or brilliance as not to cause glare or to impair the vision of the driver of any mo tor vehicle, or to otherwise interfere with any driver's operation of a motor vehicle.

F. Moves or has any animated or moving parts.

G. Is erected or maintained upon trees or painted or drawn upon rocks or other natural features.

H. Is structurally unsafe or in disrepair as determined by the Department.

I. If it is determined by the Department that action is taken by an legal authority that does not amount to or come within a comprehensive zoning plan, a permit for the erection of a billboard will be denied and not authorized.
[10/31/98; 18.21.5.10 NMAC – Rn, 18 NMAC 21.5.10, Recompiled 11/16/01]

18.21.5.11 SIGN CONTENTS PROHIBITED: Signs containing the following copy are prohibited.

A. The imitation or simulation of official U.S. Interstate, state or county highway sign shields within advertising displays.

B. Prohibited words: Any words that could be construed as a command, such as "stop, slow, turn right (or left), straight ahead," or any such words whether used alone or in combination on signs which duplicate or resemble official signs so as to cause a motorist to be misled in any manner.
[10/31/98; 18.21.5.11 NMAC – Rn, 18 NMAC 21.5.11, Recompiled 11/16/01]

18.21.5.12 LANDMARK SIGNS: An outdoor advertising device will qualify as a landmark sign of historical or artistic significance upon presentation of satisfactory proof that the sign has been lawfully in place at the same location of a period of 25 years or more, and that the sign has not substantially changed in size, lighting or message content after designation as a landmark sign will terminate the landmark status.
[10/31/98; 18.21.5.12 NMAC – Rn, 18 NMAC 21.5.12, Recompiled 11/16/01]

18.21.5.13 MAXIMUM SIZE AND AREA LIMITATIONS:

A. The maximum area of the surface of any outdoor advertising device shall be 1,200 square feet, with a maximum length of 60 feet and a maximum height of 25 feet. Length and height measurements shall include border and trim, but shall not include any ornamental base or apron support.

B. An exception to the above is to be found in directional signs which are limited to a maximum area of 150 square feet and no more than 20 feet in any dimension. Public service signs are limited to thirty-two (32) square feet.

C. The areas shall be measured by the smallest square, rectangle, triangle, circle, or combination thereof which will encompass the basic advertising face.

D. Where two (2) advertisements are involved on a single facing, the total square feet of each advertisement shall not exceed 350 square feet. Where two (2) structures are involved at the same location, each structure must be separately permitted.

E. Where four (4) advertisements are involved on a back to back structure or a double facing, the total square feet of each advertisement shall not exceed 350 square feet. Each face must be separately permitted.

F. The maximum area of any single advertisement on a single facing shall not exceed 1,200 square feet. Each facing of a double-faced or back to back sign must meet this same standard.
[10/31/98; 18.21.5.13 NMAC – Rn, 18 NMAC 21.5.13, Recompiled 11/16/01]

18.21.5.14 BACK-TO-BACK AND V-TYPE SIGNS: Sign and sign facing placement will be permitted as described in the Outdoor Advertising Handbook.
[10/31/98; 18.21.5.14 NMAC – Rn, 18 NMAC 21.5.14, Recompiled 11/16/01]

18.21.5.15 MINIMUM SPACING REQUIREMENTS: For all signs other than Directional Signs:

A. Interstate Highways and Controlled Access Freeways: No two signs on the same side of the right-of-way shall be spaced less than 500 feet apart inside and outside villages and cities.

B. Non-Freeway Primary Highways: Outside of incorporated villages and cities, no two signs on the same side of the right-of-way shall be spaced less than 300 feet apart.

C. Inside incorporated villages and cities, no two (2) signs on the same side of the right-of-way shall be spaced less then 100 feet apart on non-freeway primary highways.

D. Directional and official signs such as historic markers or illegal signs within the right-of-way shall not be counted nor shall measurements be made from them for purposes of determining compliance with the 500, 300 or 100-foot spacing requirements.
[10/31/98; 18.21.5.15 NMAC – Rn, 18 NMAC 21.5.15, Recompiled 11/16/01]

18.21.5.16 INTERSECTIONS, INTERCHANGES, AND SAFETY REST AREAS: Outside of incorporated villages and cities, no sign structure shall be placed within 500 feet of an interchange, or an intersection at grade, or a safety roadside rest area or any portion of an interstate or primary highway which is a limited access highway. Said 500 feet to be measured along the interstate or limited access primary highway from the beginning or ending of the pavement widening at the exit from the entrance to the main-traveled way. The spacing-between-structures provisions do not apply to sign structures separated by buildings or other obstructions in such a manner that only one sign structure located within the above spacing distance is visible from the highway at one time.
[10/31/98; 18.21.5.16 NMAC – Rn, 18 NMAC 21.5.16, Recompiled 11/16/01]

18.21.5.17 MEASUREMENTS OF UNZONED COMMERCIAL OR INDUSTRIAL AREAS: An unzoned commercial or industrial area shall be measured from the outer edge of the regularly used buildings, parking lots, storage or processing areas of the activities, and not from the property line of the activity, unless the property line and outer edge of the building, parking lots, storage or processing areas of the activities should coincide. Such measurements shall be along or parallel to the edge of the right-of-way of the highway.
[10/31/98; 18.21.5.17 NMAC – Rn, 18 NMAC 21.5.17, Recompiled 11/16/01]

18.21.5.18 SIMULATED COMMERCIAL ACTIVITY: Buildings or activities constructed or initiated to simulate legitimate commercial or industrial activity but not constituting commercial or industrial activity, shall not be used as a basis for determining unzoned commercial areas.
[10/31/98; 18.21.5.18 NMAC – Rn, 18 NMAC 21.5.18, Recompiled 11/16/01]

18.21.5.19 TEMPORARY UNZONED COMMERCIAL - INDUSTRIAL AREAS: Buildings or open sales areas actively used for commercial or industrial purposes for six (6) or more consecutive months will qualify an area as unzoned commercial or industrial zone, provided a 12-month business license for that activity is obtained from the local governing authority.
[10/31/98; 18.21.5.19 NMAC – Rn, 18 NMAC 21.5.19, Recompiled 11/16/01]

18.21.5.20 DIRECTIONAL SIGNS REQUIREMENTS:

A. Directional Signs Prohibited: The following signs are prohibited:

(1) Signs advertising activities that are illegal under federal or state laws or regulations in effect at the location of those signs or at the location of those activities.

(2) Signs located in such a manner as to obscure or otherwise interfere with the effectiveness of an official traffic sign, signal, or device, or obstruct or interfere with the driver's view of approaching, merging, or intersection traffic.

(3) Signs which are erected or maintained upon trees or painted or drawn upon rocks or other natural features.

(4) Obsolete signs.

(5) Signs which are structurally unsafe or in disrepair.

(6) Signs which move or have any animated or moving parts.

(7) Signs located in rest areas, parklands, or scenic areas.

B. Size Requirement of Directional Signs: No sign shall exceed the following limits:

(1) maximum area - 150 square feet;

(2) maximum height - 20 feet;

(3) Maximum length - 20 feet.

C. All dimensions include border and trim, but exclude supports.

D. Lighting of Directional Signs: Signs may be illuminated, subject to the following:

(1) Signs, which contain, include, or are illuminated by any flashing, intermittent, or moving light or lights are prohibited.

(2) Signs which are not effectively shielded so as to prevent beams or rays of light from being directed by any portion of the traveled way of an interstate or primary highway or which are of such intensity or brilliance as to cause glare or to impair the vision of the driver of any motor vehicle, or which otherwise interfere with any driver's operation of a motor vehicle are prohibited.

E. No sign may be so illuminated as to interfere with the effectiveness of or obscure an official traffic sign, device or signal.

F. Spacing of Directional Signs:

(1) Each location of a directional sign must be approved by the Department.

(2) No directional sign may be located within 2,000 feet of an interchange or intersection at grade along the interstate system of other freeways (measured along the interstate of freeway from the nearest point of the beginning or ending of pavement widening at the exit from or entrance to the main-traveled way).

(3) No directional sign may be located within 2,000 feet of the rest area, parkland, or scenic area.

(4) No two directional signs facing the same direction of travel shall be spaced less than one (1) mile apart.

(5) Not more than three directional signs pertaining to the same activity and facing the same direction of travel, may be erected along a single route approaching the activity.

(6) Signs located adjacent to the interstate system shall be within 75 air miles of the activity.

(7) Signs located adjacent to the primary system shall be within 50 air miles of the activity.

G. Permitted Content of Directional Signs: The message of directional signs shall be limited to the identification of the attraction or activity and directional information useful to the traveler in locating the attraction, such as mileage, route numbers, or exit numbers. Descriptive words or phrases, and pictorial or photograph representations of the activity or its environs are prohibited.

[10/31/98; 18.21.5.20 NMAC – Rn, 18 NMAC 21.5.20, Recompiled 11/16/01]

18.21.5.21 LIGHTING RESTRICTIONS: Signs shall not be placed with illumination that interferes with the effectiveness of any official traffic sign or device. Signs shall not include or be illuminated by flashing, intermittent or moving lights (except that part necessary to given public service information such as time, date, temperature, weather or similar information). No sign shall cause beams or rays of light of such intensity or brilliance to be mistaken for a warning or danger signal as to cause glare or impair the vision of any driver's operation of a motor vehicle.

[10/31/98; 18.21.5.21 NMAC – Rn, 18 NMAC 21.5.21, Recompiled 11/16/01]

18.21.5.22 APPLICANTS FOR SIGN PERMITS: No outdoor advertising device or facing allowed under Section 8.6 or 8.7 [Subsections F. and G., Section 8 of 18.21.5 NMAC] may be erected or maintained unless the owner of the outdoor advertising device or facing first submits an application for a permit and obtains a permit for the device or facing from the State Maintenance Bureau of the Department. Exceptions to this requirements are:

A. Signs on a piece of property giving notice that said specific land and/or improvements alone are offered for sale. Generalized real estate signs are not excepted.

B. On-premise signs advertising goods or services from sale on the premises.

[10/31/98; 18.21.5.22 NMAC – Rn, 18 NMAC 21.5.22, Recompiled 11/16/01]

18.21.5.23 APPLICATION FEES:

A. Each application shall be accompanied by a nonrefundable $100 fee. If the lessor or lessee changes, the new names and addresses of parties to the lease shall be provided to the Department.

B. Directional sign applications need not be accompanied by a fee.

[10/31/98; 18.21.5.23 NMAC – Rn, 18 NMAC 21.5.23, Recompiled 11/16/01]

18.21.5.24 SIGN PERMIT TAGS:

A. Upon the approval of an application for a permit, a sign permit tag will be issued for the specific sign at a given location. Within thirty (30) days of issuance (one hundred and twenty (120) days should the sign structure not be constructed at the date of such issuance), the sign permit tag shall be affixed to the lower corner of the face of the sign nearest the right-of-way line or to the face of the upright, leg, or pole of the structure nearest the right-of-way line.

B. Permit tags are transferable with the ownership of signs, but may not be relocated from one site to another. Permit tags are issued to specific signs at specific locations and shall not be transferred from one location to another. Any change in size or location of the advertising device will require a new application and a new permit tags.

[10/31/98; 18.21.5.24 NMAC – Rn, 18 NMAC 21.5.24, Recompiled 11/16/01]

18.21.5.25 RENEWAL OF SIGN PERMIT TAGS: Sign permits are issued on a calendar year basis, January 1, through December 31. Every permit must be renewed each year and accompanied by a $25 renewal fee. Permanent metal tags will be issued with fees collected annually in advance.

[10/31/98; 18.21.5.25 NMAC – Rn, 18 NMAC 21.5.25, Recompiled 11/16/01]

18.21.5.26 TIME LIMITS: Sign permits will be valid from the date of their issuance until the following January 1, and permit tags will be valid from the date of their issuance until otherwise notified by the Department, except that when a sign which is the subject of the issuance of a permit and tag is not erected at the date of such issuance, such sign must be erected within one hundred and twenty (120) days after such issuance, with the tag properly affixed, or the permit and tag will be void. Upon written request to the Department, a one time sixty (60) day extension to erect a previously permitted sign, may be granted.

[10/31/98; 18.21.5.26 NMAC – Rn, 18 NMAC 21.5.26, Recompiled 11/16/01]

18.21.5.27 PERMIT TAG REPLACEMENT: Lost permit tags may be voided and replaced within a month of issuance upon the submission of the new application. Damaged or stolen permit tags may be voided and replaced upon application or within thirty (30) days of notification by the Department that the tag is not on the sign. There will be a $25 charge for each replacement.

[10/31/98; 18.21.5.27 NMAC – Rn, 18 NMAC 21.5.27, Recompiled 11/16/01]

18.21.5.28 LOCAL ZONING AUTHORITIES: Local political subdivisions shall have authority under their own zoning laws to zone areas for commercial or industrial purposes, and the bona fide action of such local political subdivision in this regard will be accepted for the purposes of these regulations. The Department will not issue permits for the erection of the new signs in areas where counties and municipal zoning ordinances are in effect and which require a permit to be issued for such signs by the county or municipal authority, unless the applicant has received a permit for the sign from the governmental authority promulgating such ordinances, and a copy of the approved permit application or a letter granting approval is attached to the Departments sign permit application; provided, however, in areas zoned commercial or industrial by a county law, provisions of NMAC 10.9 [10.9 NMAC] shall apply.

[10/31/98; 18.21.5.28 NMAC – Rn, 18 NMAC 21.5.28, Recompiled 11/16/01]

18.21.5.29 NEW HIGHWAY CONSTRUCTION: A permit will not be issued for a sign to be located along a new interstate or primary route, until the route is accepted by the Department and is open to traffic.

[10/31/98; 18.21.5.29 NMAC – Rn, 18 NMAC 21.5.29, Recompiled 11/16/01]

18.21.5.30 SIGN OWNER NAME PLATES: All signs must have affixed the sign owner's name and address on a separate name panel of wood or metal construction fastened to the sign. A commercial sign company shall limit it name plate to its trade name only, provided that the trade name is as indicated on all the company's outdoor advertising permit applications.

[10/31/98; 18.21.5.30 NMAC – Rn, 18 NMAC 21.5.30, Recompiled 11/16/01]

18.21.5.31 REMOVAL OF NON-COMPENSABLE SIGNS: Permit Violations: Any outdoor advertising device, which has been erected or maintained in violation of the permit requirements of the Beautification Act or this rule, which has been erected or maintained without timely payment of all permit fees required by the Beautification Act or this rule, is subject to removal by the Department without compensation and at the expense of

the owner of the outdoor advertising device. Such removal will be preceded by notice to the owner of the outdoor advertising device, if known, that the device must be removed within 30 days of will be subject to removal by the Department at the owner's expense. If the outdoor advertising device is not removed within 30 days, the Department may thereafter remove the device at the expense of the owner of the device without any compensation whatsoever.
[10/31/98; 18.21.5.31 NMAC – Rn, 18 NMAC 21.5.31, Recompiled 11/16/01]

18.21.5.32 LOCATION VIOLATIONS AND ENCROACHMENTS: Any outdoor advertising device which has been erected and maintained under permit but is at variance from the location set forth in the permit application is subject to removal by the Department without any compensation whatsoever and at the expense of the owner of the outdoor advertising device.

A. Any outdoor advertising device which has been erected, in such a manner that all or part of the device encroaches into or upon the right of way of any interstate system or primary system, as defined by the Beautification Act, is subject to removal by the Department without any compensation whatsoever and at the expense of the owner of the outdoor advertising device.

B. Such removals will be preceded by notice by certified mail to the owner of the outdoor advertising device and to the owner of the land upon which the device is located that the device must be removed within thirty (30) days or will be subject to removal by the Department at the owner's expense. If the outdoor advertising device is not removed within the thirty (30) days, the Department may thereafter remove the device at the expense of the owner of the device and without any compensation whatsoever.
[10/31/98; 18.21.5.32 NMAC – Rn, 18 NMAC 21.5.32, Recompiled 11/16/01]

18.21.5.33 VIOLATION OF STANDARDS AND SPECIFICATIONS: Any outdoor advertising device which has been erected and maintained in accordance with all permit and permit fee requirements of the Beautification Act and this Rule, but which does not conform to the standards and specifications of the Beautification Act and this rule pertaining to size, lighting, content location, maintenance, spacing and construction is subject to removal by the Department without any compensation whatsoever and at the expense of the owner of the outdoor advertising device. Such removal will be preceded by notice via Certified Mail to the owner of the device, and to the owner of the land if known, upon which the device is located of the particular standards and specification that the device violates, and that the violations must be corrected within thirty (30) days or the device will be subject to removal by the Department at the owner's expense. If the failure to conform to the standards and specifications is corrected within the said thirty (30) days, then said failure will be deemed cured for all purposes; if, the defects are not corrected within the thirty (30) days, the Department may thereafter remove the outdoor advertising device at the expense of the owner of the device without any compensation whatsoever.
[10/31/98; 18.21.5.33 NMAC – Rn, 18 NMAC 21.5.33, Recompiled 11/16/01]

18.21.5.34 LANDOWNER INTERFERENCE WITH SIGN REMOVAL: Landowners who interfere with the removal of signs from their property, preventing either the sign owner or the Department from removing same, maybe liable for the costs of a forced removal.
[10/31/98; 18.21.5.34 NMAC – Rn, 18 NMAC 21.5.34, Recompiled 11/16/01]

18.21.5.35 CUSTOMARY MAINTENANCE OF CONFORMING SIGNS: Customary maintenance shall be performed on all permitted signs.

A. No process will frequently involve a change of legend and delays in reselling the advertising surface. For the purpose of these regulations, six (6) months will be the time limit allotted sign owner to restore and replace live legends at which time the Department may give a thirty (30) day notice to the owner to revitalize the sign or remove it as abandoned. Should no action be taken in thirty (30) days, the Department may remove the sign at the owner's expense.

B. No sign, which has been blank for a period of one (1) year, shall be issued a renewal permit for the next calendar year, a new application for a permit must be submitted.
[10/31/98; 18.21.5.35 NMAC – Rn, 18 NMAC 21.5.35, Recompiled 11/16/01]

18.21.5.36 CUSTOMARY MAINTENANCE OF NON-CONFORMING SIGNS: A non-conforming sign increased in size by 30% or more from the original inventory is illegal and subject to removal.

A. Should any design or structural change be made to a non-conforming sign so as to result in an increase in said sign's value, such increase in value shall be deemed non-compensable should said sign be acquired by the Department through the condemnation process.

B. A non-conforming sign when destroyed by natural causes may not be reconstructed and its permit shall be revoked. Reconstruction shall render the sign a new structure and illegal and its permit shall be revoked.

C. Non-conforming signs erected before May 19, 1966, which have been destroyed through vandalism, may be re-erected in kind or may be offered to the State for purchase according to the procedures set forth in the Beautification Manual.

[10/31/98; 18.21.5.36 NMAC – Rn, 18 NMAC 21.5.36, Recompiled 11/16/01]

18.21.5.37 MAINTENANCE PROHIBITED FROM HIGHWAY RIGHT-OF-WAY:

A. No sign owner shall maintain or erect any advertising device from or in the right-of-way of any interstate or primary highway.

B. Any sign owner violating this provision of these regulations shall have his sign permit revoked whether or not the sign is conforming and such action shall render the sign illegal and subject to immediate removal.

[10/31/98; 18.21.5.37 NMAC – Rn, 18 NMAC 21.5.37, Recompiled 11/16/01]

18.21.5.38 RIGHT-OF-WAY LANDSCAPE DAMAGE: It is unlawful for any sign owner or his agents to damage the landscape of any public right-of-way. These damages are more specifically described as follows:

A. Cutting trees on the right-of-way for the purpose of facilitating the readability of an outdoor advertising device.

B. Damage to any landscaping, such as grass, shrubs, rocks, gravel, or cement.

C. Damage to any improvements in the right-of-way such as fences, ditches, structures, etc. The sign owner shall be liable for and shall reimburse the State for the cost of replacing any and all features of the right-of-way to its original condition and shall have his sign permit revoked for any signs involved in such acts.

[10/31/98; 18.21.5.38 NMAC – Rn, 18 NMAC 21.5.38, Recompiled 11/16/01]

18.21.5.39 MOBILE TYPE SIGNS: No advertising devices shall be displayed that are attached or placed on mobile vehicles or trailers.

[10/31/98; 18.21.5.39 NMAC – Rn, 18 NMAC 21.5.39, Recompiled 11/16/01]

18.21.5.40 MUNICIPAL LAND OWNERSHIP: City property located in an area governed by these regulations not zoned, whether within or outside city, town or village limits, must conform to these regulations in every respect concerning the unzoned commercial or industrial area. This applies to signs and advertising devices intended to advertise the local community or local community services.

[10/31/98; 18.21.5.40 NMAC – Rn, 18 NMAC 21.5.40, Recompiled 11/16/01]

18.21.5.41 FARMING-AGRICULTURAL AND RELATED ACTIVITIES: The use of feeder pens, farming and dairy facilities including pastures, milk parlors, and on-premise sale of dairy products or farm products shall not constitute an unzoned commercial or industrial zone.

A. Roping arenas, rodeo grounds, or fair grounds will not be considered unless activities open to the public are conducted continuously six (6) consecutive months or more during each calendar year.

B. Any sign adjacent to both an Interstate System and Primary System, which is located within the control area of both systems must meet the spacing requirements of the Interstate Highway System.

[10/31/98; 18.21.5.41 NMAC – Rn, 18 NMAC 21.5.41, Recompiled 11/16/01]

18.21.5.42 ON-PREMISE SIGNS: On-premise signs are defined and limited to signs advertising on-premise activities only and are further defined as follows:

A. Signs used to advertise the activities conducted on the property where the sign is located. (See the definition of On-Premise Signs [18.21.5.7 NMAC]).

B. There must be a regularly used building, and/or service, and/or repair, and/or processing, and/or storage, and/or parking area used in conjunction with the on-premise activity.

C. Land, whether contiguous or not, and whether owned or not, that is not used as part of the major activity as set forth herein, but is surplus if it is held for future use, shall not quality as a part of the immediate on premise area, including railroad mainline tracks, siding, spurs, and loading docks.

D. The lands that are directly used as an integral part of the principal activity of the subject advertised, even though the sign site and principal activity is separated by highway shall be deemed to be contiguous.

E. Definition of on-premise parking lots, storage areas, servicing areas, are those areas regularly used in conjunction with on-premise activity and have continued maintenance of the surfacing and lighting.

F. When the activity, which is advertised by an on-premise sign ceases for six (6) consecutive months, then the on-premise sign advertising that activity become illegal and a public nuisance and subject to removal under these regulation.

[10/31/98; 18.21.5.42 NMAC – Rn, 18 NMAC 21.5.42, Recompiled 11/16/01]

18.21.5.43 MISCELLANEOUS PROVISIONS AND RESTRICTIONS:

A. Stopping or parking on the right-of-way of any controlled access highway, or violation of the access control line to service any advertising device, is unlawful and constitutes grounds for revocation of the permit as to such advertising device. In the event of such revocation the advertising device which is the subject of the revoked permit is illegal and subject to removal without compensation to the owner.

B. Proposed outdoor advertising devices which will be located in areas covered by the Highway Beautification Act and these Rules, and which require a permit issued by the Department, shall not be erected prior to the issuance of such permits. If any advertising device is erected in violation of this requirement said advertising device is illegal and subject to removal without compensation to the owner.

[10/31/98; 18.21.5.43 NMAC – Rn, 18 NMAC 21.5.43, Recompiled 11/16/01]

18.21.5.44 PENALTIES FOR REPEATED VIOLATIONS: If repeated violations establish a pattern or practice of disregard for these rules and regulations, permitting privileges are subject to suspension. A notification of such intent to suspend permitting privileges will be sent to the sign owner, stating the grounds therefor.

A. Any person upon receipt of a notice of intent to suspend shall have a right to a hearing on whether the suspension should be invoked. A hearing shall be requested within fourteen (14) days from the receipt of the notice.

B. Any person requesting a hearing shall be notified of the time, place and procedures for the hearing.

[10/31/98; 18.21.5.44 NMAC – Rn, 18 NMAC 21.5.44, Recompiled 11/16/01]

HISTORY OF 18.21.5 NMAC:

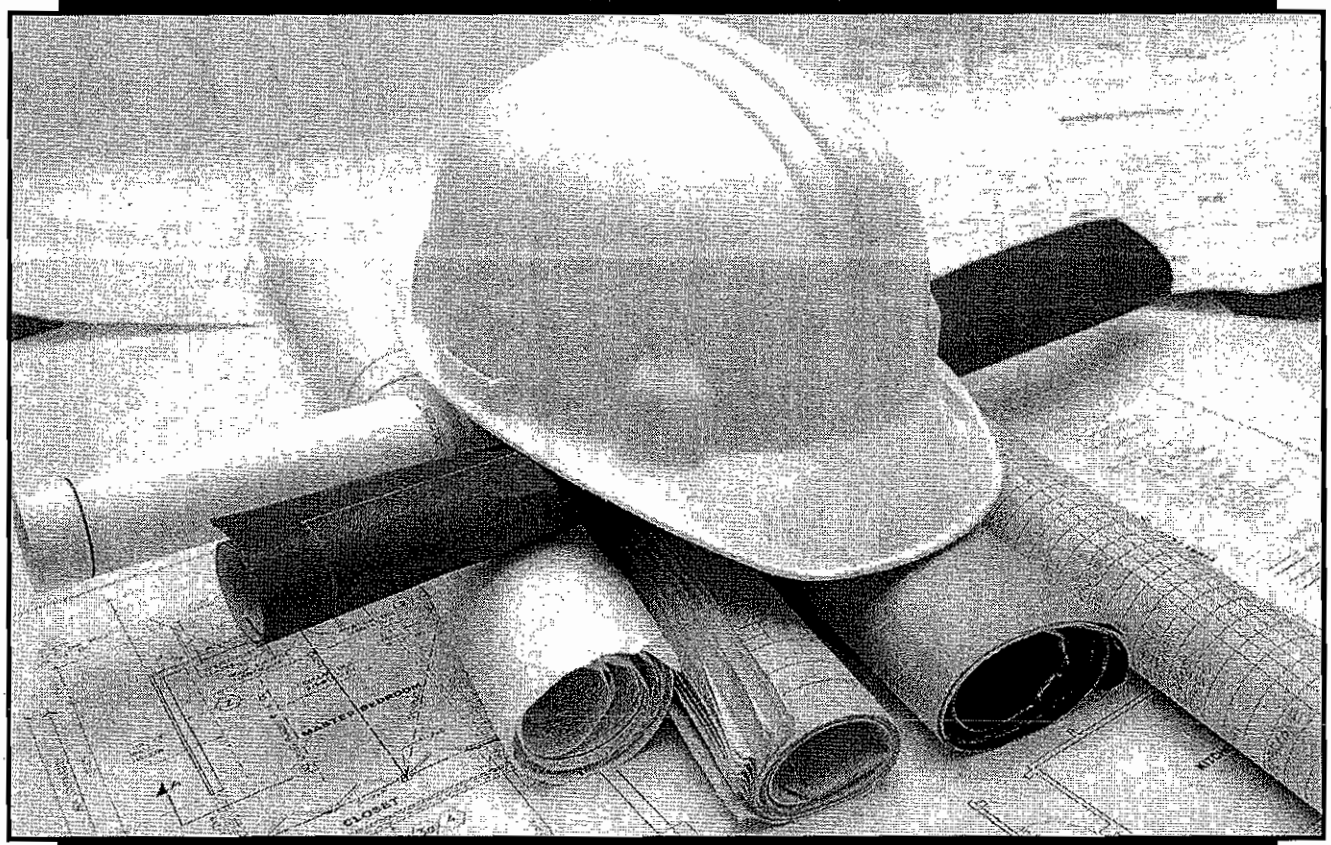
Pre-NMAC History: The material in this Part was derived from that previously filed with the State Records and Archives under: LD 1, Outdoor Advertising filed August 25, 1970; SHC Rule 77-1, Outdoor Advertising Rules and Regulations, supersedes Rule LD 1, filed March 15, 1977; SHC Rule 78-1, Outdoor Advertising Rules and Regulations; supersedes SHC 77-1, filed September 21, 1978; SHTD Rule90-3(L), Outdoor Advertising Rules and Regulations; supersedes SHC 78-1, filed February 19, 1991.

History of Repealed Material: [RESERVED]

ATTACHMENT "H"

Webinar: "Current Issues in Digital Billboards"

Current Issues in Digital Billboards and Sign Regulations



Presented by:

William D. Brinton, *Rogers Towers*

Robin M. Wolpert, *Greene Espel P.L.L.P.*

P.O. Box 509 • Eau Claire, WI 54702-0509 • Phone: 866-352-9539 • Fax: 715-833-3953
Email: customerservice@lorman.com • Web: www.lorman.com • Seminar ID: 386129

This manual was created for online viewing. State specific information in this manual is used for illustration and is an example only.

Current Issues in Digital Billboards and Sign Regulations

Prepared by:
William D. Brinton, *Rogers Towers*
Robin M. Wolpert, *Greene Espel P.L.L.P.*

© 2010 Lorman Education Services. All Rights Reserved.

All Rights Reserved. Lorman seminars are copyrighted and may not be recorded or transcribed in whole or part without its express prior written permission. Your attendance at a Lorman seminar constitutes your agreement not to record or transcribe all or any part of it. This publication is designed to provide general information on the seminar topic presented. It is sold with the understanding that the publisher is not engaged in rendering any legal or professional services. Although this manual is prepared by professionals, it should not be used as a substitute for professional services. If legal or other professional advice is required, the services of a professional should be sought.

This disclosure may be required by the Circular 230 regulations of the United States Treasury and the Internal Revenue Service. We inform you that any federal tax advice contained in this written communication (including any attachments) is not intended to be used, and cannot be used, for the purpose of (i) avoiding federal tax penalties imposed by the federal government or (ii) promoting, marketing or recommending to another party any tax related matters addressed herein.

The opinions or viewpoints expressed by the faculty members do not necessarily reflect those of Lorman Education Services. These materials were prepared by the faculty members who are solely responsible for their correctness and appropriateness.

Lorman Education Services, P.O. Box 509, Eau Claire, WI 54702-0509 • Phone: 866-352-9539 • Fax: 715-833-3953
Email address: customerservice@lorman.com • Website: www.lorman.com • Seminar ID: 386129

LORMAN EDUCATION SERVICES:

A Company With a REPUTATION for SUCCESS

Are you looking for additional ways to receive training and continuing education?

SEMINARS:

Since 1987, Lorman has sponsored thousands of continuing education seminars across the U.S. and Canada. Attend a full-day program to hear the latest in industry updates and regulation changes that will keep your business current and in compliance. Learn from local experts and network with other professionals in your industry. For a complete listing of upcoming seminars in your area, visit www.lorman.com/seminars.

SEASON PASS:

Lorman's Season Pass gives you the ability to customize a continuing education package that will satisfy you or your company's needs of continuing education for the next 12 months. With the Season Pass, you purchase your pass up-front and we'll knock **15-40% off** the original price, depending on the size of your pass. The Season Pass is transferable to anyone in your company and can be used at any of Lorman's OnDemand webinars or teleconferences. Visit www.lorman.com/seasonpass for more information.

PARTNERSHIPS:

Do you belong to a state or local bar, society or association? Become a Lorman partner and your organization could earn commission and discounted training and products. Visit www.lorman.com/contact/associations.php for more information.

IN-HOUSE CORPORATE TRAINING:

Lorman offers the convenient option of bringing training and continuing education seminars right to your facility. Featured training programs or customized courses are available for any size group. Save time and money by not having to send your team away for training. To learn more, visit www.lorman.com/inhouse.

NEWSLETTERS:

These free newsletters will provide you with updates on current issues and hot topics in your industry. Each of our newsletters delivers timely and accurate information directly to you via email. To sign up for updates and view archived newsletters, visit www.lorman.com/newsletters.

BOOKSTORE:

Can't find the seminar you are looking for? Search Lorman's extensive resource library containing thousands of audio recordings, books and reference manuals. Visit www.lorman.com/bookstore.

CERTIFICATES:

Earn your Human Resources Professional Development™ certificate, Construction Compliance™ certificate or Certificate of Banking Compliance™ by attending a Lorman-sponsored seminar or teleconference. Our professional certificates were developed in conjunction with leading experts in their respective industries. For complete information on these certificates, please visit www.lorman.com/certification/hrpd, www.lorman.com/certification/cc or www.lorman.com/certification/cbc.

ON DEMAND:

Looking for a convenient way to fulfill all of your continuing education needs? OnDemand webinars allow you to view 90-minute programs from the comfort and convenience of your home or office. All you need is an Internet connection. Accessible 24 hours a day, 7 days a week – you can view, pause, rewind and replay at your convenience. Visit the OnDemand library at www.lorman.com/ondemand.

"The ability to learn faster than your competitors may be the only sustainable competitive advantage."

— Arie de Geus

Table of Contents

Current Issues in Digital Billboards and Sign Regulations

The Federal Highway Beautification Act and Digital Billboards 3

Studies – Traffic Safety and Aesthetics 6

The Cost-Benefit Analysis of Sign Regulation and Regulatory Options 15

Micro Level Regulations – Recurring Issues 29

Consequences of Cap and Trade Agreements Involving Digital Signs 37

Slides *39*

Lorman Education Services is a registered provider with The American Institute of Architects Continuing Education Systems. Credit earned upon completion of this program will be reported to CES Records for AIA members. Certificates of Completion for non-AIA members are available upon request.

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods and services will be addressed at the conclusion of this presentation.

The learning objectives met in attending this program are:

- You will be able to summarize regulations of digital signs by the Federal Highway Administration and the impact on local and state governments.
- You will be able to give examples of studies impacting digital signs.
- You will be able to discuss quote litigation outcomes.
- You will be able to identify and avoid sign litigation.

Current Issues in Digital Billboards and Sign Regulations

Prepared and Presented by:

William D. Brinton
Rogers Towers
Robin M. Wolpert
Greene Espel P.L.L.P.

LORMAN CLE MATERIALS: WILLIAM D. BRINTON AND ROBIN WOLPERT

I. The Federal Highway Beautification Act and Digital Billboards, William D. Brinton

II. Studies—Traffic Safety and Aesthetics, William D. Brinton

III. The Cost-Benefit Analysis of Sign Regulation and Regulatory Options, Robin Wolpert

IV. Micro-Level Regulations—Recurring Issues, Robin Wolpert

V. Consequences of Cap and Trade Agreements Involving Digital Signs, William D. Brinton

I. THE FEDERAL HIGHWAY BEAUTIFICATION ACT AND DIGITAL BILLBOARDS. WILLIAM D. BRINTON, ROGERS TOWERS, P.A.

The federal Highway Beautification Act ("HBA") was originally enacted on October 22, 1965, and has been amended several times over the ensuing years. In connection with billboards, the HBA regulation of what are commonly known today as "digital" billboards is dependent upon whether the billboard is designated "conforming" or "nonconforming" under the provisions of the HBA.

The term "digital" billboard is used today to describe a type of billboard that has variously been known over the years as a "spectacular," a "commercial electronic variable message sign" (CEVMS), a "light-emitting diode sign" (LED sign), and/or an electronic variable message board. The common element among these nominal variations is the use of a form of lighting that manipulates or changes the message at programmed intervals.

The all important issue, discussed herein, is the interval at which the advertising message changes. The state-federal agreements implementing the HBA address "lighting" and will typically prohibit "animation" as well as "flashing" or "intermittent" changes; however, the terms "flashing" and "intermittent" are not defined. It is commonly recognized that the term "intermittent" is the term that controls the outcome of the debate over whether or not a "digital" billboard runs afoul of a state-federal agreement. As discussed below, the exceptions from the prohibition on "intermittent" changes should logically provide the context for an understanding of the use of the term "intermittent."

It is important to recognize that there is no enforcement mechanism under the HBA other than a provision allowing for the federal government to withhold ten percent (10%) of a state's federal highway funding in the event that a state does not maintain effective control over outdoor advertising. Federal Highway Administration ("FHWA") division offices monitor the states' compliance with the HBA, and these division offices report to FHWA headquarters in Washington, D.C. The FHWA will issue guidance memoranda from time to time to assist regulators in their enforcement responsibilities.

State departments of transportation will take steps at the state level to ensure that state laws and regulations follow the requirements of HBA so that federal highway funds are not placed at risk through a withholding penalty. Despite these steps, problems arise from time to time when states, through legislative or administrative action or inaction, fail to effectively enforce the regulations of the HBA.

As mentioned above, each state has an agreement (the "state-federal agreement") with the United States Department of Transportation that generally covers its obligation to enforce the HBA and its regulations. These agreements date back to the 1960s and early 1970s. Many states provide that the state shall follow the commitments in its state-federal agreement through statutory and/or administrative provisions. These commitments typically flow down to the local governments through state legislation passed to ensure compliance at the local level.

To fully understand the role of a state in the enforcement of the HBA provisions, one should review the state-federal agreement, together with the state statutes and administrative regulations, promulgated to implement its provisions.

To fully understand the complexity of the issues surrounding digital billboards, one should start by reviewing the FHWA website.

The following commentary appears on the FHWA website under STATE/FEDERAL AGREEMENTS -- TERMS:

> In the lighting provision of most State/Federal agreements off-premise signs in commercial and industrial areas that contain, include, or are illuminated by any flashing, intermittent, or moving light(s) are prohibited, except those giving public service information such as time, date, temperature, weather, or similar information.
>
> In 1978, Congress amended 23 U.S.C. 131 to allow signs advertising activities conducted on the property on which the signs are located to change their message at reasonable intervals by electronic process or by remote control. The reasonableness in the frequency of message changes has been left up to the individual States. During debate in the Senate, the congressional intent was made clear that this change did not affect off-property signs.
>
> FHWA, historically considered that the prohibition of flashing, intermittent, or moving lights in the various State/Federal agreements applied to all off-premise commercial electronic variable message signs (CEVMS), regardless of message interval. Several States have determined that such signs did not violate the lighting provision in their State/Federal agreement. Consequently, the FHWA provided guidance during 1996 and again on September 25, 2007 which provides States latitude to interpret their agreement to determine lighting requirements. Guidance reference: http://www.fhwa.dot.gov/realestate/offprmsgsnguid.htm
>
> In deciding whether to allow off-premise signs using rotating slats, or CEVMS, the applicable State law and agreement should be interpreted on an individual State basis, and if applicable, with court interpretation.

Source: http://www.fhwa.dot.gov/REALESTATE/oacprog.htm#TERMS

A. Nonconforming Locations

A "nonconforming" location under the HBA is a location where a new billboard is prohibited from being erected. New billboards are prohibited if the parcel is not zoned commercial or industrial, or if the new billboard would be too close to another pre-existing billboard. Older billboards that were lawfully erected prior to the effective implementation of the HBA regulations are allowed to continue to exist and to be maintained. These grandfathered billboards are often termed nonconforming billboards, as they do not conform to the HBA regulations (and/or do not conform to state or local regulations).

If a nonconforming billboard exists along a roadway subject to the HBA regulations, it may not be converted to a mechanical tri-vision billboard or to a "digital" billboard. Such a conversion of a static billboard goes beyond simply allowing a nonconforming billboard to continue to exist. The FHWA has addressed these issues in guidance memoranda, including a 1996 Guidance Memorandum that pertained to tri-vision billboards and a 2007 Guidance Memorandum that pertained to digital billboards.

The federal prohibition on converting a nonconforming billboard along a federally-funded roadway may not be fully understood (or even known) at the local level. In states where there is a lack of enforcement by state officials, this can become a serious problem for a local government that faces the possibility of a new digital billboard being converted or erected at a nonconforming location.

Any questions should first be directed to the FHWA-Realty Officer for the FHWA-Division Office for the state in question, or to the FHWA-Realty Office at FHWA in Washington. Contact information is easily located on the FHWA website.

B. Conforming Locations

Considerable controversy was generated by the FHWA Guidance Memorandum regarding "digital" billboards and dated September 25, 2007. While the memorandum correctly directed attention to the individual state-federal agreements, the memorandum at the same time stated that a prohibition on "intermittent" changes would not be triggered as long as the change was not more frequent than once every four seconds, with eight seconds being recommended.

The Guidance Memorandum simultaneously drew praise from the outdoor advertising industry and criticism from scenic organizations. For outdoor advertisers, the memorandum gave a green light to proceeding with the build-out of more digital billboards that could change just as rapidly as possible to display new messages to passing motorists. For scenic organizations, the memorandum heightened safety concerns as well as a material degradation in roadside aesthetics.

As the controversy unfolds, attention has focused on the term "intermittent." The exceptions to the prohibition on "intermittent" lighting deal with messages pertaining to a change in date, time, temperature, and the like. The scenic community points out that these types of changes, such as a change in date or temperature, could only mean that the term "intermittent"

must mean a time interval far longer than four (or even) ten seconds; otherwise, there would be no need for such an exception to "intermittent" messages. The FHWA has suggested that the 2007 guidance memorandum is an outgrowth of a July 17, 1996 memorandum that allowed similar intervals for mechanical tri-visions that had previously been prohibited as animated signs, until FHWA's interpretation of animated signs changed so as to allow the mechanically changing tri-visions. The scenic community regards the 1996 guidance memorandum on tri-visions as a loophole inasmuch as mechanically-changing devices do not involve "lighting."

The FHWA July 17, 1996 Guidance Memorandum (Barbara K. Orski) can be viewed at:

http://knowledge.fhwa.dot.gov/cops/rex.nsf/All+Documents/A6CEB01DB7EE07228525725E004F01A9/$FILE/071796.pdf

The FHWA September 25, 2007 Guidance Memorandum (Gloria M. Shepherd) can be viewed at:

http://www.fhwa.dot.gov/REALESTATE/offprmsgsnguid.htm

The Outdoor Advertising Association of America's position on digital signs can be obtained at www.oaaa.org. Scenic America's position on digital signs can be obtained at www.scenic.org.

II. STUDIES - TRAFFIC SAFETY AND AESTHETICS. WILLIAM D. BRINTON, ROGERS TOWERS, P.A.

The twin pillars underlying the purpose of sign regulations are traffic safety and aesthetics. The courts have generally acceded to the common sense of lawmakers on these issues in supporting restrictions on signs .

A. Aesthetics

Limitations on sign characteristics based upon aesthetics have been broadly upheld by the courts. Recently, the Sixth Circuit upheld the reasons for restrictions on the height and size of signs as being so self-evident that a separate purpose clause for the same was unnecessary. Midwest Media Property, LLC v. City of Erlanger, Ky., 2009 WL 2488112 (6th Cir.). The aesthetic impact of spectacular, CEVMS, LED, and digital displays, like the impacts of sign height and size, have not necessitated any recent studies by engineers or other professionals.

In the FHWA's June 1980 Final Report, "Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage" (Report No. FHWA/RD-80/051), the Executive Summary discussed Aesthetic Considerations in the context of CEVMS as follows:

> **Harsh visual contrast with the ambient environment is generally considered to be unaesthetic, as is a dense clustering of signs and sign structures.** The existence of these conditions in many commercial areas has led to criticism of on-premise signing practices in the past. Manufacturers of CEVMS claim that their signs are designed and constructed to avoid characteristics that are generally

> associated with deterioration of the visual quality of roadsides, and that these signs have the added capability of reducing the need for the separate conventional signs of multiple businesses since CEVMS can display their messges (sic, messages) in repeated series on a single sign. To date, however, these claimed benefits have not been empirically tested. **The capability of CEVMS for commanding and holding attention permits them to dominate their surroundings, and involves the risk of incompatibility with the natural or man-made environment in which they reside.** It should be noted that the "electrical spectacular" displays most often associated with Times Square or Las Vegas, and more recently with major-league sports stadiums are, in fact, electronic variable message signs. Without the proper control, there is little reason to believe that signs such as these will be kept away from the highway right-of-way.

(Emphasis added.)

The FHWA 1980 Report referenced the "harsh visual contrast" and the "risk of incompatibility with the natural or man-made environment." These aesthetic concerns are among those that motivate many local communities to prohibit or to strictly regulate digital signs, both on-premise and off-premise. It is highly unlikely that any court would actually require a "study" to confirm the validity of these concerns.

B. Traffic Safety

Traffic safety, on the other hand, continues to generate an interest in scientific studies.

Although signage issues involve non-governmental signs, it is important to remember the existence of the Manual on Uniform Traffic Control Devices (the "MUTCD"), which has been developed over decades of research to establish nationwide standards followed by traffic engineers and local governments in furtherance of traffic safety. It is ironic that such great care is taken as to the characteristics and placement of official signs along the nation's roadways and highways, but then within the same field of vision for the motorist there is a remarkably different set of rules where traffic safety competes with other interests.

With the proliferation of digital signs, both off-site signs (which we commonly know as billboards, also known as advertising signs or non-accessory signs) and on-site signs (also known as accessory signs), there has been a great deal of interest in obtaining more information as to traffic safety issues.

Most of the recent scientific interest has been directed to billboards, but the growth of the digital sign industry has ramifications for all signage intended to be viewed from the road.

Several studies have been commissioned by the billboard industry, but most studies have been commissioned by and/or prepared for government agencies, including those directly concerned with traffic safety.

1. Industry-sponsored studies (four studies).

a. *Driving Performance in the Presence or Absence of Billboards*, by Suzanne Lee, Erik Olsen, and Maryanne C. DeHart. (VTTI February 29, 2003).

VTTI's 2003 *Driving Performance Study*, sometimes referred to as the Lee Study or the Charlotte Study, was sponsored and funded by the Outdoor Advertising of America's Foundation for Outdoor Advertising Research and Education. This study exemplifies the problems inherent to an industry-funded study. The study was the focus of scrutiny in several lawsuits brought by members of the outdoor advertising industry. Its principal author was Dr. Suzanne Lee and she was called as an expert witness in support of the industry's position that billboards posed no threat to traffic safety.

In Nichols Media Group, L.L.C. v. Town of Babylon, 365 F.Supp.2d 295 (E.D.N.Y. 2005), the district court rejected Dr. Lee's opinion testimony, finding that the Lee Study lacked credibility and reliability:

> Dr. Lee presented the results of a study that she conducted in Charlotte, North Carolina. This study purported to show that driver behavior was not influenced by the presence of billboards (the "Lee Study"). The Lee Study was funded by the Foundation for Outdoor Advertising Research and Education, a close affiliate of the Outdoor Advertising Association of America, which is the leading trade association for those who erect billboard advertising (the "OAAA"). Trial testimony revealed that representatives of the OAAA were intimately involved in the design and conduct of the Lee Study. Indeed, the results of the Lee Study were presented at a meeting of the OAAA where billboard industry leaders characterized the study as proving "definitively" that billboards do not inhibit driver performance. The Lee Study has been neither widely disseminated nor subject to peer review. Nor have the conclusions of the Lee Study been replicated in any other study.
>
> **When considering the testimony of Dr. Lee, the court holds that the Lee Study is so infected by industry bias as to lack credibility and reliability.** This conclusion is supported not only by industry involvement in the design and execution of the study but also by the lack of peer review and the fact that there is no other scientific study with the same or similar conclusions regarding driver distraction. For these reasons, the court rejects Dr. Lee's conclusions regarding traffic safety.

Id. at 308 (emphasis added).

b. *Driving Performance and Digital Billboards*, by Suzanne E. Lee, Melinda J. McElheny, and Ronald Gibbons. (VTTI March 22, 2007).

VTTI's 2007 *Driving Performance and Digital Billboard Study*, like the 2003 *Driving Performance Study*, was sponsored and funded by the Outdoor Advertising of America's

Foundation for Outdoor Advertising Research and Education, and focused on digital billboards in the Cleveland area. The 2007 *Driving Performance Study* has attracted some attention from other researchers undertaking government-sponsored studies (discussed below). The study made some comparisons with the earlier 2003 *Driving Performance Study* of conventional billboards in the Charlotte area.

The Conclusions included the following observations:

> The overall conclusion, supported by both the eyeglance results and the questionnaire results, is that the digital billboards seem to attract more attention than the conventional billboards and baseline suites (as shown by a greater number of spontaneous comments regarding the digital billboards and by longer glances in the direction of the billboards). The comparison events, 25% of which included signs with digital components, showed very similar results to the digital billboards. Thus, there appears to be some aspect of the digital billboards and on-premises signs that holds the driver's attention once the driver has glanced in that direction. This is most likely the result of the intrinsic lighting of these signs, which is noticeable even during the daytime. Drivers may also have maintained longer glances towards the digital billboards in the hopes of catching the next message (knowing that the message changed periodically), although an analysis of longer glances did not bear this out.

c. *A Study of the Relationship Between Digital Billboards and Traffic Safety in Cuyahoga County, Ohio*, by Albert Martin Tantala, Sr., P.E., and Michael Walter Tantala, P.E. (Tantala Associates July 7, 2007).

The 2007 *Tantala Relationship Study* also focused on digital billboards in the Cleveland area, and was also sponsored and funded by the Outdoor Advertising of America's Foundation for Outdoor Advertising Research and Education. This study has attracted some attention from other researchers undertaking government-sponsored studies (discussed below).

The purpose of the 2007 *Tantala Relationship Study* was described as:

> The purpose of this study is to examine the relationship between certain digital billboards and traffic safety. For this study, a study area was identified, data was collected, and an analysis was made of the area's digital billboards, traffic, and accidents. Specifically, this study analyszes the traffic and accident data near seven existing, digital billboards on the Interstate routes in Cuyahoga County, Ohio. These seven billboards are located along four major, Interstate Routes (I-77, I-90, I-271, and I-480), and were converted in July 2005 to digital billboards from conventional billboards.

The 2007 *Tantala Relationship Study* concluded:

> The overall conclusion of this study is that digital billboards have no statistical relationship with the occurrence of accidents. The frequency of traffic accidents may be much more likely attributable to, and correlated with other facts, such as DUIs, deer hits, adverse weather conditions, excessive speeding, *inter alia*.

d. *A Study of the Relationship Between Digital Billboards and Traffic Safety in Rochester, MN*, by Michael Walter Tantala, P.E. and Albert Martin Tantala, Sr., P.E., (Tantala Associates April 6, 2009).

The 2009 *Tantala Relationship Study* focused on digital billboards in the Rochester area and, once again, was sponsored and funded by the Outdoor Advertising of America's Foundation for Outdoor Advertising Research and Education. The 2009 Study has attracted some attention from other researchers undertaking government-sponsored studies (discussed below). The 2009 *Tantala Relationship Study* followed a similar methodology as the 2007 *Tantala Relationship Study* for the billboards in Cleveland, Ohio.

The 2009 *Tantala Relationship Study* focused on five digital billboards (378-square feet in size) that had been converted from conventional static billboards to digital billboards in November 2006, February 2007, March 2007, August 2007, and January 2008. The billboards were owned by Magic Media.

The purpose of the 2009 *Tantala Relationship Study* was described as:

> The purpose of this study is to examine the statistical relationship between digital billboards and traffic safety in Rochester, Minnesota. This study analyzed traffic and accident data along local roads near five existing, digital billboards...with traffic volumes collectively representing 56 million vehicles per year. The study uses official data as collected, compiled and recorded independently by the Rochester Police Department.

The 2009 *Tantala Relationship Study* concluded:

> The overall conclusion is that the digital billboards in Rochester have no statistically significant relationship with the occurrence of accidents. This conclusion is based on the Rochester Police Department's own data and an objective statistical analysis.

2. Government and government-sponsored studies (four studies).

a. *Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage*, Report No. FHWA/RD-80/051, by Jerry Wachtel and Ross Netherton, Office of Research, Federal Highway Administration, Department of Transportation. (FHWA June 1980).

The FHWA 1980 Study was directed to on-premise CEVMS signage for on-premise signs due to a change in federal law that allowed on-premise CEVMS signage in all states. Many aspects of this early study are still relevant today; however, it is often forgotten that Congress did not intend for CEVMS to be utilized for off-premise signs, commonly known as billboards.

The FHWA's Executive Summary provided this Historical Background:

National standards and Federal-State agreements providing for control of outdoor advertising prohibit display of commercial signs that use flashing, intermittent or moving lights, or that have animated or moving parts. In 1978 the Congress amended the Highway Beautification Act to provide that it would not be considered a breach of such agreements to permit signs to display information which is "changed at reasonable intervals by electronic process or remote control and which provide public service information or advertise activities conducted on the property on which they are located."

This research report, prepared by the Federal Highway Administration's (FHWA) Office of Research, is intended to provide background information for the development of standards for the use of on-premise commercial electronic variable-message signs (CEVMS) displaying such public service information and advertising messages along Interstate System highways. The report is based on a critical review of reported research, operational experience, and legislative history relating to CEVMS and to outdoor advertising generally.

The study added under Technology the following:

The 1978 amendments to the Highway Beautification Act provide an opportunity for the electric sign industry to increase the use of CEVMS along the Interstate System. This report discusses the potential implications of such increased use in the context of the three areas of public interest that Congress sought to protect through the Highway Beautification Act, namely: (1) promotion of highway safety; (2) preservation and enhancement of natural beauty along the highways; and (3) protection of highway investment.

The 1980 FHWA Study's Purpose was described as follows:

I. PURPOSE

The purpose of this report is to provide background information for the development of standards relating to the use of commercial electronic variable-message signs (CEVMS) for display of public information and commercial advertising in roadside areas. The report is based on a critical review of existing research literature, relevant experience of State highway and transportation agencies regarding such signs, and legislative history relating to CEVMS and to outdoor advertising generally.

This study was undertaken by the Environmental Division of the Office of Research at the request of the Office of Right of Way, Federal Highway Administration in October 1978, and completed in December 1979.

The 1980 FHWA Study recommended additional research on the following question, as it relates to CEVMS signage:

> Is there a demonstrable relationship between the presence of roadside commercial advertising signs in general, and CEVMS in particular, and driver distraction, information processing ability, or workload?

However, there has no been further FHWA research, and the issue remained largely unaddressed until recent years.

b. *Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*, by J. Fabry, K. Wochinger, T. Shafer, N. Owens, and A. Nedzesky, of Science Applications International Corporation. (SAIC September 11, 2001).

This 2001 *Research Review* was performed for the Safety Core Business Unit, Office of Real Estate, Federal Highway Administration.

The abstract of the 2001 *Research Review* (report) stated:

> This report is a research review of potential safety implications of electronic billboards (EBBs) on driving safety. The review covers the interval from a similar review published in 1980 to the present. The present review focuses on the safety aspects of EBBs and does not examine aesthetic issues. Included are a review of research on driver performance in the presence of EBBs and contacts with federal and state officials to describe state regulatory practices concerning EBBs. An account of tri-vision signs is part of the state review. Knowledge gaps are identified based on the literature review and these gaps support the development of a set of research questions and related research findings. Research questions are divided into roadway characteristics such as curves, interchanges, and work zones; EBB characteristics such as exposure time, motion and legibility; and driver characteristics such as familiarity and age. Related findings on the legibility of Changeable Message Signs (CMSs) are also included.

The recommendations from the 1980 and 2001 reports were then revisited in February 2009 (discussed below), with a further study now being undertaken.

c. *A Critical, Comprehensive Review of Two Studies Recently Released by the Outdoor Advertising Association of America, Final Report*, by Jerry Wachtel, CPE, President, The Veridian Group, Inc. (Veridian Group October 18, 2007).

While FHWA was moving slowly to undertake further study, the industry-sponsored studies released in 2007 triggered a state highway department to request an independent peer review of the conclusions being disseminated by the outdoor advertising industry.

This 2007 *Wachtel Critical Review Report* was prepared for, and at the request of, the Maryland State Highway Administration as a result of the issuance of the 2007 *Driving Performance Study* and the 2007 *Tantala Relationship Study*. Mr. Wachtel, the reviewer, stated that he had been asked to perform an independent peer review of each of those two studies. The reviewer recited that the research methods and statistical analyses employed in the two industry-sponsored studies were incapable of determining causality.

The 2007 *Wachtel Critical Review Report*, at pages 28-29, stated:

> Because of the public relations campaign with which the OAAA released and publicized these two studies, they may have received wide press coverage in print, online, and in the broadcast media. Without exception, this coverage has presented uncritical acceptance of these two reports as presented, with no scrutiny of their scientific or technical soundness. As a result, numerous States and local government agencies have begun to modify their codes and ordinances that address the use of digital billboards along the roadside. Having completed this peer review, it is our opinion that acceptance of these reports as valid is inappropriate and unsupported by scientific data, and that ordinance or code changes based on their findings is ill advised. Even the Federal Highway Administration (FHWA) has issued a recent policy memorandum in which DBBs are given tacit acceptance under certain conditions, possibly based in part on the release of these two studies. Because FHWA remains concerned about the safety implications of EBBs on highways, and because of its stated intention to conduct or sponsor its own research into this issue, it seems to this writer logical that any such policy change await further developments from research.

d. *The Effects of Commercial Electronic Variable Message Signs (CEVMS) on Driver Attention and Distraction: An Update*, Report No. FHWA-HRT-09-018, by John A. Molino, Jerry Wachtel, John E. Fabry, Megan B. Hermosillo, and Thomas M. Granda, Human Centered Systems Team, Office of Safety Research and Development, Federal Highway Administration. (FHWA February 2009).

This *FHWA February 2009 Report* consisted of an update of the first study (the FHWA June 1980 Report) and the second study (the FHWA September 2001 Report). The February 2009 Report noted, "The first study was completed in 1980 and the second in 2001. Since then, CEVMS technology has evolved, in particular the expanded use of programmable formats and messages. The present report concentrates on identifying potential factors that may contribute to determining whether there are any significant safety concerns or distraction effects with regard to CEVMS used for outdoor advertising."

The *FHWA February 2009 Report* recommended, for the first stage of a proposed research program, that an on-road instrumented vehicle study be utilized to determine driver safety effects due to CEVMS exposure. This recommendation was later accepted, and an on-road instrumented vehicle study is underway.

The results of this new study are expected in the first half of 2010. In the interim, Mr. Wachtel released a *Safety Impacts Study* (discussed below), although the same was not commissioned by any governmental unit.

3. Other studies

a. *Safety Impacts of the Emerging Digital Display Technology for Outdoor Advertising Signs*, by Jerry Wachtel, CPE, President, The Veridian Group, Inc. (Veridian Group April 2009).

As noted above, Mr. Wachtel had been involved in the preparation of government studies for the past three decades. Mr. Wachtel has also served as an expert witness for members of the outdoor advertising industry. In April 2009, he released a *Safety Impacts Study* that addressed the literature on the issue of digital signs. Mr. Wachtel included a section that addressed the industry-sponsored studies in Section 3, pages 88-114, of the report.

The 2009 *Safety Impacts Study* noted:

> Because of the pressures being put on State and local Governments to issue permits for DBBs, and because of the threat of litigation should such permits be denied or revoked, the States have asked for an update about the state of knowledge that results from the latest research. In addition, the States would like to know what guidelines and/or regulations exist in other jurisdictions with regard to DBBs, and have asked for recommendations for appropriate, realistic, data driven guidelines that they might consider adopting for their own streets and highways, and pending updated guidance from FHWA.
>
> The present report, therefore, represents a comprehensive, critical review of the most recent research literature in this field. To a large extent, the research discussed herein has been conducted since the most recent (2001) FHWA report was published. Several earlier studies are discussed, however, either because they were not captured in the two FHWA reports, or because their methods and findings are directly relevant to the questions now being asked. A number of these studies have not been widely reported or are controlled, internal documents. We are grateful to their authors for making them available to us.
>
> After the critical literature review in Section 2, subsequent sections of this report address: research performed on behalf of the outdoor advertising industry, human factors considerations relevant to driver response to these technologies, guidelines and regulations in place or under consideration in other jurisdictions, recommendations for guidance that States and local governments might adopt in the near term, and new technologies and applications for outdoor advertising. After a brief summary, the final report section identifies the references cited in this study.

The 2009 *Safety Impacts Study* contained the following in its summary and conclusions:

> Then again, we have rarely required proof of actual crash causation prior to setting speed limits, restricting in-vehicle mobile telephone use, or even developing current billboard operational and location restrictions. The argument against the control of DBBs because studies to date have not proven a cause and effect relationship between DBBs and crashes is simply spurious. It would seem sufficient to initiate action based on a level of consistency achieved in research. And such consistency is now being achieved.
>
> It is likely that those who feel that no guidance or regulations can be promulgated until we have clear proof of causality will continue to argue that there is

insufficient information to take any action in this regard regarding roadside DBBs. But those who think that their job is to do what they can to enhance safety for the traveling public based upon the best available information, now have, in our opinion, access to a strong and growing body of evidence, including evidence from industry supported research, that roadside digital advertising, attract (sic, attracts) drivers' eyes away from the road for extended, demonstrably unsafe periods of time.

States and local jurisdictions faced with permit applications or challenges to denied permits need to have a sound basis for their decisions. The research underway by FHWA as this is written may begin to provide specific, directed answers to assist these officials in their work. In the interim, these governmental agencies and toll road operators, faced with the need to make such decisions now have, in our opinion, a sufficient and sound basis for doing so.

III. THE COST-BENEFIT ANALYSIS OF SIGN REGULATION AND REGULATORY OPTIONS. ROBIN WOLPERT, GREENE ESPEL, PLLP

Whether and how to regulate dynamic signs are discretionary policy choices. Those choices should be made in light of the local government's cost-benefit analysis of safety, aesthetics, planning, and other policy considerations and the legality of various regulations.

Picking the best policy for your community unavoidably involves the degree of risk-aversion, and aesthetic and policy preferences, of your elected officials.

Identifying a safety risk is just the beginning – cities must also consider how *averse* they are to that level of risk.

A municipality may ban digital signs. See Naser Jewelers v. City of Concord, NH. Concord prohibited all "electronic message center type signs."

However, following the lead of federal and state laws, many communities have carved out exceptions to allow dynamic signs that present "public service information," "electronic message centers," or signs owned by governments or non-profits. However, in the eyes of *some* judges: **A sign regulation is only as constitutional as its exceptions (Metromedia v. City of San Diego, 453 U.S. 490, 540 (1981) (plurality)), and**

1. the constitutional requirement of content-neutrality should be taken literally, see Advantage Media LLP v. City of Hopkins, 379 F.Supp.2d 1030, 1040-41 (D. Minn. 2005) (Davis, J.); Clear Channel Outdoor, Inc. v. City of St. Paul, No. 02-1060 (DWF/AJB), 2003 WL 21857830 (D. Minn. Aug. 4, 2003) (Frank, J.), so that exceptions for dynamic signs displaying public service information may violate the requirement of content-neutrality because their enforcement depends on what a sign says.

2. Even when content-neutrality is established, exceptions allowing the government itself to "participate in the vice" complicate its ability to justify treating such signs as harmful. See Rubin v. Coors Brewing Co., 514 U.S. 476, 489 (1995) (there was "little chance" that the speech restriction could have directly and materially advanced its aim, "while other provisions of the same Act directly undermined and counteracted its effects"); Lawson v. City of Kankakee, Ill., 81 F.Supp.2d 930, 934 (C.D.Ill. 2000) ("If the City were so worried that signs on terraces looked bad, it would not have chosen to place a sign there itself. Surely its own sign is no less unattractive than Plaintiff's.").

Local governments that have devoted the most attention to this subject recently have taken approaches that tend to fall within six discrete "modes" of regulation, ranging from an absolute or near-absolute prohibition of dynamic signs to encouraging dynamic signs.

A. Complete or Near-Complete Bans

1. Maple Valley, WA (2003): a complete ban

ORDINANCE NO. O-03-228, Amending Title 18 of the Maple Valley Municipal Code relating to signs

D. PROHIBITED SIGNS:

The following signs or displays are prohibited in all zones within the City.

* * *

3. Animated signs or displays;

* * *

6. Electronic changeable message signs,[1] except for temporary signs required by government agencies for road and street repairs,

[1] DEFINITIONS: * * * 24. Electronic Changeable Message Sign: An electronically activated sign whose message content or display, either whole or in part, may be changed by means of electrical, electronic or computerized programming. A sign or portion of a sign on which the message or display is an electronic indication of fuel price shall be considered an Electronic

and similar activities. This prohibition includes, but is not necessarily limited to, signs which include animation, flashing, traveling, or scrolling messages or displays[2];

7. Flashing signs[3] or displays,;

* * *

12. Moving signs;

* * *

14. Festoons, pennants, or blinking lights;

2. Concord, NH (2007 revisions): total ban on all electronic message centers.

Prohibits all signs that "appear animated or projected" or " are intermittently or intensely illuminated or of a traveling, tracing, scrolling, or sequential light type" or "contain or are illuminated by animated or flashing light." Code of Ordinances 28-6-7(h).

3. St. Croix County, WI (June 19, 2007): a ban with a time-and-temperature exception.

a. St. Croix County Code of Ordinances/Land Use and Development

b. Findings of Fact (§17.65(A) (1) (a)(3, 7)):

(i) "Signs can create safety hazards that threaten the public health, safety or welfare. Such a safety threat is particularly great for signs that are structurally inadequate, or that may confuse or

---

Changeable Message Sign. A sign on which the sole message or display is an electronic indication of time and/or temperature shall be considered an Electronic Changeable Message Sign. Drive-through Business/menu signs are not considered Electronic Changeable Message Signs.

[2] DEFINITIONS: * * * 72. Scrolling Displays: The vertical movement of a static message or display on an electronic changeable message sign.

[3] DEFINITIONS: * * * 29. Flashing Sign: A sign of which any portion of it changes light intensity, switches on and off in a constant pattern, or contains moving parts or the optical illusion of motion caused by use of electrical energy or illumination, with a display that appears for less than one and one-half consecutive seconds.

distract drivers or pedestrians, or that may interfere with official directional or warning signs."

(ii) "With one narrow exception, only static signs (which change, if at all, only on rare occasions when they are repainted or covered with a new picture) constitute a customary use of signage in the County.[4] The only non-static signs that constitute a customary use of signage in the County are components of on-premise signs for which frequent changes are necessary for the purpose of updating numerical hour-and-minute, date, and temperature information. Such changes are unique because their accuracy depends upon their ability to frequently change, and because in their customary use such signs are apt to distract drivers or pedestrians to a dangerous degree than other types of non-static signs."

c. Prohibitions (§ 17.65 (C) (3)):

d. Signs and sign components and elements of faces of signs shall not flash, move, travel or use animation.

e. Unless a sign's only illumination is external and uncolored, the following additional regulations shall also apply to that sign:

(i) No illuminated off-premises sign which changes in color or intensity of artificial light at any time while the sign is illuminated shall be permitted.

(ii) No illuminated on-premises sign which changes in color or intensity of artificial light at any time when the sign is illuminated shall be permitted, except one for which the changes are necessary for the purpose of correcting hour-and-minute, date, or temperature information.

(iii) A sign that regularly or automatically ceases illumination for the purpose of causing the color or intensity to have changed when illumination resumes shall fall within the scope of the prohibitions of par. f. 1) and 2) above.

---

[4] St. Croix County's findings regarding "customary use" have the intended effect of causing "non-customary use" signs that are adjacent to federal-aid highways to also violate the federal Highway Beautification Act, even if they are in a commercial or industrial zone. See 23 U.S.C. § 131 (d) ("Whenever a bona fide State, county, or local zoning authority has made a determination of customary use, such determination will be accepted in lieu of controls by agreement in the zoned commercial and industrial areas within the geographical jurisdiction of such authority.") and Wisc. Trans. R. 201.20 (5).

(iv) The scope of [this subsection's] prohibitions include, but are not limited to, any sign face that includes a video display, LED lights that change in color or intensity, 'digital ink,' and any other method or technology that causes the sign face to present a series of two or more images or displays.

4. Bloomington, MN (2006): small steps short of a full ban.

a. Bloomington Zoning Code §§ 19.66 and 19.100-108.

b. Findings (§ 19.100):

(i) "With respect to electronic signs, including video display signs, the City Council finds that they are highly visible from long distances and at very wide viewing angles both day and night and are designed to catch the eye of persons in their vicinity and hold it for extended periods of time. If left uncontrolled, electronic signs, including video display signs, constitute a serious traffic safety threat." A set of enumerated reports and studies "reveal that electronic signs are highly distracting to drivers and that driver distraction continues to be a significant underlying cause of traffic accidents."

c. Prohibitions (§§ 19.66(b), and 19.108 (h) (4-6, 8)):

d. Billboards (i.e. advertising signs which have an area exceeding 150 square feet) which utilize electronic display techniques –

(i) must have a minimum duration of 20 minutes and must be a static display;

(ii) cannot move or appear to move;

(iii) cannot fluctuate in light intensity or use intermittent, strobe or moving light to create the illusion of movement;

(iv) are only permitted in certain commercial and industrial districts; and

(v) must meet specified standards prohibiting non-instantaneous transitions, limiting brightness, and requiring dimmer controls.

e. Video display signs (i.e. a sign that changes its message or background in a manner or method of display characterized by motion or pictorial imagery, which may or may not include text and depicts action or a special effect to imitate movement, the presentation of pictorials or graphics displayed in a progression of frames which give the illusion of motion, but not including electronic changeable copy signs as defined below) that are not billboards –

(i) must not be visible from residential property or from any motored way,

(ii) are excluded from residential, conservation and bluff protection zones; and

(iii) must be set back 100 feet from an abutting residential district and 35 feet from other electronic changeable copy signs.

f. Electronic graphic display signs (i.e. a sign or portion thereof that displays electronic, static images, static graphics or static pictures, defined by a small number of matrix elements using different combinations of LEDs, fiber optics, light bulbs or other illumination devices within the display area where the message change sequence is accomplished immediately or by means of fade, repixalization or dissolve modes) that are not billboards –

(i) cannot change more frequently than every 20 minutes;

(ii) may be seen from a motored way, but must not be visible from residential property if within 150 feet;

(iii) are excluded from residential, conservation, and bluff protection zones; and

(iv) must be set back 100 feet from an abutting residential district and 35 feet from other changeable copy signs.

g. Electronic changeable copy signs (i.e. a sign or portion thereof that displays electronic, non-pictorial, text information in which each alphanumeric character, graphic, or symbol is defined by a small number of matrix elements using different combinations of LEDs, fiber optics, light bulbs or other illumination devices within the display area, but not including time-and-temperature signs as defined below) that are not billboards –

(i) may include up to ten words of text, but not pictures;

(ii) cannot change more frequently than every 8 seconds (in a non-residential area), and every one hour in a residential area;

(iii) may be seen from a motored way, but must not be visible from residential property if within 150 feet;

(iv) may in theory appear in a residential zone, but not in a conservation or bluff protection zone;

(v) must be set back 100 feet from an abutting residential district and 35 feet from other changeable copy signs.

h. Time and temperature signs (i.e. a sign which displays exclusively current time and temperature information) that are not billboards –

(i) Cannot change more frequently than every 2 seconds;

(ii) No visibility or special setback limits; and

(iii) are excluded from residential, conservation, and bluff protection zones.

B. Minnetonka's Approach To Off-Premise Dynamic Displays: Citywide Permission To Operate, Under Distraction-Reducing And Proliferation-Reducing Conditions

1. [in the criteria in subd. 4 for a monument identification sign], "7) message centers/time and temperature displays permitted but the maximum area for display is 50 percent of the potential copy and graphic area of the monument identification sign."

2. [in the prohibitions section], "revolving and moving signs except electronic message center/time and temperature display signs according to subdivision 4 and search lights according to subdivision 8," and "flashing, blinking or animated signs including but not limited to traveling lights or any other means not providing constant illumination except electronic message center/time and temperature display signs according to subdivision 4 and search lights according to subdivision 8."

3. The City's definition of "flashing sign" is very broad, extending the ban to signs on which illumination is not kept stationary or constant in intensity and color at all times when such sign is in use." §300.02 (117).

4. New subsection 14 ("Dynamic Displays")

a) Findings. Studies show that there is a correlation between dynamic displays on signs and the distraction of highway drivers. Distraction can

lead to traffic accidents. Drivers can be distracted not only by a changing message, but also by knowing that the sign has a changing message. Drivers may watch a sign waiting for the next change to occur. Drivers are also distracted by messages that do not tell the full story in one look. People have a natural desire to see the end of the story and will continue to look at the sign in order to wait for the end. Additionally, drivers are more distracted by special effects used to change the message, such as fade-ins and fade-outs. Finally, drivers are generally more distracted by messages that are too small to be clearly seen or that contain more than a simple message. Time and temperature signs appear to be an exception to these concerns because the messages are short, easily absorbed, and become inaccurate without frequent changes.

Despite these public safety concerns, there is merit to allowing new technologies to easily update messages. Except as prohibited by state or federal law, sign owners should have the opportunity to use these technologies with certain restrictions. The restrictions are intended to minimize potential driver distraction and to minimize proliferation in residential districts where signs can adversely impact residential character.

Local spacing requirements could interfere with the equal opportunity to use such technologies and are not included. Without those requirements, however, there is the potential for numerous dynamic displays to exist along any roadway. If more than one dynamic display can be seen from a given location on a road, the minimum display time becomes critical. If the display time is too short, a driver could be subjected to a view that appears to have constant movement. This impact would obviously be compounded in a corridor with multiple signs. If dynamic displays become pervasive and there are no meaningful limitations on each sign's ability to change frequently, drivers may be subjected to an unsafe degree of distraction and sensory overload. Therefore, a longer display time is appropriate.

A constant message is typically needed on a sign so that the public can use it to identify and find an intended destination. Changing messages detract from this way-finding purpose and could adversely affect driving conduct through last-second lane changes, stops, or turns, which could result in traffic accidents. Accordingly, dynamic displays generally should not be allowed to occupy the entire copy and graphic area of a sign.

In conclusion, the city finds that dynamic displays should be allowed on signs but with significant controls to minimize their proliferation and their potential threats to public safety.

b) Regulations. Dynamic displays on signs are allowed subject to the following conditions:

1) Dynamic displays are allowed only on monument and pylon signs for conditionally permitted uses in residential districts and for all uses in other districts. Dynamic displays may occupy no more than 35 percent of the actual copy and graphic area. The remainder of the sign must not have the capability to have dynamic displays even if not used. Only one, contiguous dynamic display area is allowed on a sign face;

2) A dynamic display may not change or move more often than once every 20 minutes, except one for which changes are necessary to correct hour-and-minute, date, or temperature information. Time, date, or temperature information is considered one dynamic display and may not be included as a component of any other dynamic display. A display of time, date, or temperature must remain for at least 20 minutes before changing to a different display, but the time, date, or temperature information itself may change no more often than once every three seconds;

3) The images and messages displayed must be static, and the transition from one static display to another must be instantaneous without any special effects;

4) The images and messages displayed must be complete in themselves, without continuation in content to the next image or message or to any other sign;

5) Every line of copy and graphics in a dynamic display must be at least seven inches in height on a road with a speed limit of 25 to 34 miles per hour, nine inches on a road with a speed limit of 35 to 44 miles per hour, 12 inches on a road with a speed limit of 45 to 54 miles per hour, and 15 inches on a road with a speed limit of 55 miles per hour or more. If there is insufficient room for copy and graphics of this size in the area allowed under clause 1 above, then no dynamic display is allowed;

6) Dynamic displays must be designed and equipped to freeze the device in one position if a malfunction occurs. The displays must also be equipped with a means to immediately discontinue the display if it malfunctions, and the sign owner must immediately stop the dynamic display when notified by the city that it is not complying with the standards of this ordinance;

C. Consolidating Advertising In A Few Well-Placed Dynamic Signs

1. Minnetonka's "incentives" provision.

Purposes and Findings:

Outdoor advertising signs do not need to serve the same way-finding function as do on-premises signs. Further, outdoor advertising signs are no longer allowed in the city, and there is no potential that they will proliferate. Finally, outdoor advertising signs are in themselves distracting and their removal serves public safety. The city is extremely limited in its ability to cause the removal of those signs. This clause is intended to provide incentives for the voluntary and uncompensated removal of outdoor advertising signs in certain settings. This removal results in an overall advancement of one or more of the goals set forth in this section that should more than offset any additional burden caused by the incentives. These provisions are also based on the recognition that the incentives create an opportunity to consolidate outdoor advertising services that would otherwise remain distributed throughout the community.

Criteria for issuance of an enhanced dynamic signage permit:

(1) "A person may obtain a permit for an enhanced dynamic display on one face of an outdoor advertising sign if the following requirements are met:"

(a) The applicant agrees in writing to permanently remove, within 15 days after issuance of the permit, at least two other faces of an outdoor advertising sign in the city that are owned or leased by the applicant, each of which must satisfy the criteria of parts (b) through (d) of this subsection. This removal must include the complete removal of the structure and foundation supporting each sign face. The applicant must agree that the city may remove the sign if the applicant does not timely do so, and the application must be accompanied by a cash deposit or letter of credit acceptable to the city attorney sufficient to pay the city's costs for that removal. The applicant must also agree that it is removing the sign voluntarily and that it has no right to compensation for the removed sign under any law.

(b) The city has not previously issued an enhanced dynamic display permit based on the removal of the particular faces relied upon in this permit application.

(c) Each removed sign has a copy and graphic area of at least 288 square feet and satisfies two or more of the following additional criteria:

(1) The removed sign is located adjacent to a highway with more than two regular lanes and with a general speed limit of 45 miles per hour or greater, but that does not have restrictions on access equivalent to those of an interstate highway;

(2) All or a substantial portion of the structure for the removed sign was constructed before 1975 and has not been substantially improved;

(3) The removed sign is located in a noncommercial zoning district;

(4) The removed sign is located in a special planning area designated in the 1999 comprehensive plan; or

(5) The removed copy and graphic area is equal to or greater than the area of the copy and graphic area for which the enhanced dynamic display permit is sought.

(d) If the removed sign face is one for which a state permit is required by state law, the applicant must surrendered its permit to the state upon removal of the sign. The sign that is the subject of the enhanced dynamic display permit cannot begin to operate until proof is provided to the city that the state permit has been surrendered.

(e) The applicant must agree in writing that no dynamic displays will ever be used on one additional outdoor advertising sign that has a copy and graphic area of at least 288 square feet in size. This agreement will be binding on the applicant and all future owners of the sign. If the sign is subsequently removed or destroyed and not replaced, the holder of the enhanced dynamic display permit is not required to substitute a different sign for the one that no longer exists.

The benefits of an enhanced dynamic display permit:

(2) If the applicant complies with the permit requirements noted above, the city will issue an enhanced dynamic display permit for the designated outdoor advertising sign. This permit will allow a dynamic display to occupy 100 percent of the potential copy and graphic area and to change no more frequently than once every eight seconds. The designated sign must meet all other requirements of this ordinance.

D. A Euclidean Approach: Allowing Flashy Signs In One Or Two Zoning Overlay Districts

1. Minneapolis, MN's "downtown opportunity billboard district."

a. The City's "Downtown 2010 Entertainment Policy" noted that the policy's goals would be furthered by steps to "create street level excitement in the Entertainment District. A successful urban entertainment district requires a

street level environment that is visually exciting and that encourages pedestrian flow between various attractions."

Minneapolis City Code Section 544.90 (a) provides that "this section establishes the following Downtown Entertainment Billboard District:

(1) Downtown Entertainment Billboard District. The Downtown Entertainment Billboard District shall comprise the area bounded by the following streets: Commencing at the intersection of Sixth Street North and Hennepin Avenue, land that is south of Sixth Street North between Hennepin Avenue and Second Avenue North, east of Second Avenue between Sixth Street and Seventh Street North, north of Seventh Street North between First and Second Avenue North, First Avenue North between Seventh and Eighth Street North, Eighth Street North between First Avenue North, north of Eighth Street North between First Avenue North and Hennepin Avenue, and west of Hennepin Avenue between Sixth Street and Eighth Street North. Off-premise signs constructed in this district shall not be subject to the requirements of 544.60 and 544.70.

b. Minneapolis City Code § 544.20 (13). General provisions Flashing or animated off-premise signs, provides:

(1) Downtown Entertainment Billboard District. Flashing, blinking, and/or animated off-premise signs, including but not limited to traveling lights or other means not providing constant illumination, shall be permitted in the downtown entertainment billboard district.

(2) Downtown Entertainment Area. Flashing off-premise signs shall be permitted in this area provided the messages and/or imagery are displayed in a static manner for a minimum of eight (8) seconds. Animated off-premise signs shall be prohibited in the downtown entertainment area. The area consisting of those properties with frontage along the north side of Hennepin Avenue between Tenth Street and Fifth Street, and those properties with frontage along the south side of Hennepin Avenue between Ninth Street and Sixth Street shall be considered the downtown entertainment area for purposes of this section.

(3) Downtown Opportunity Billboard District. Flashing and/or blinking off-premise signs shall be permitted in the Downtown Opportunity Billboard District provided that outside the Downtown Entertainment Billboard District and Downtown Entertainment Area flashing signs containing changing written messages shall be limited to the news, weather, time or other

public service message with a vertical dimension that shall not exceed two (2) feet.

(4) Limited Access Roadway Opportunity Billboard District. Flashing off-premise signs shall be permitted in this area, only on Interstate 94, north of Broadway, and on Interstate 35-W, north of Hennepin, provided (i) the messages and/or imagery are displayed in a static manner for a minimum of eight (8) seconds, and (ii) flashing signs shall be a minimum of two thousand five hundred (2,500) feet from any other off-premise flashing sign reading to the same directional traffic. The credits required pursuant section 544.60(c) for any flashing off-premises signs to be located in this area shall be demonstrated by the applicant to have been removed only from the area located north of the following: from the western boundary of the city along Broadway Avenue North (including signs on both sides of Broadway) thence to the northeasterly bank of the Mississippi River, thence along the northeasterly bank of the River to Interstate 94, thence following the northern boundary of the right-of-way of Interstate 94 to the easterly boundary of the city.

F. East Dundee, IL's Video Display Overlay District And Static Electronic Display Overlay District (2006)

James Carlini, one of the Trustees of the Village of East Dundee, has characterized sign ordinances as a "horse-and-buggy bridle on business," and has advocated that local governments should "turn on profits by turning on the lights." James Carlini, "Electronic Signs for Municipalities: Las Vegas or Lost Revenues?" Wisconsin Technology Network, online edition, 05/17/06.

In 2006, East Dundee amended its sign ordinance in the following respects:

> (i) In the East Side Commercial Overlay District, "for new car dealerships, multi-tenant retail centers and amusement establishments only, the freestanding sign permitted" on a parcel "may contain a fully electronic message display consisting of words, symbols, figures or images that can be electronically or mechanically changed by remote or automatic means, including animated graphics and video, subject to the following: (a) the area of the electronic message shall not exceed 75 % of the sign area; and (b) the intensity of illumination and the movement of any illumination or the flashing, scintillating or varying of light intensity shall not constitute a traffic hazard as described in subsection 156.03(E)[[5]]." Ordinance No. 06-46, amending Code of Ordinances § 156.04 (E).

---

[5] Under 156.03(E), "In order to assure traffic safety, no sign shall be erected, relocated or maintained in a manner as will, in the determination of the Building Official, (1) by reason of size, location, content, coloring or manner of illumination, obstruct the vision of drivers or

(ii) In the Hilltop Commercial Overlay District, "for new car dealerships, multi-tenant retail centers and amusement establishments only, the freestanding sign may contain a static electronic message display capable of displaying words, symbols, figures or images that can be electronically or mechanically changed by remote or electronic means," subject to the same 75 percent limit and traffic hazard limit as signs in the other overlay district, plus a requirement that "each message on the sign shall be displayed for a minimum of 10 seconds," and "said messages shall change only through dissolve or fade transitions, or with the use of other subtle transitions and frame effects that do not have the appearance of moving text or images, but which may otherwise not have movement, or the appearance or optical illusion of movement, of any part of the sign structure, design or pictorial segment of the sign, including movement of any illumination or the flashing, scintillating or varying of light intensity." Ordinance No. 06-46, amending Code of Ordinances § 156.04 (F).

(iii) Everywhere else in the Village, "flashing signs" shall be prohibited, "moving, rotating, or animated signs or signs creating the illusion of movement shall be prohibited," and "illumination shall be constant in intensity and color, and shall not consist of flashing, animated, chasing, scintillating or other illumination conveying the sense of movement except for those signs that exhibit time and temperature . . ." Ordinance No. 06-46, amending Code of Ordinances § 156.03 (F) and (G)(5).

G. Cuyahoga Falls, OH (2003) Encouraging Certain Kinds Of Dynamic Signs Through Regulation

Cuyahoga Falls' 2003 overhaul of its sign ordinance is characterized as an "outside the box" approach by the planning consultant who drafted it, John Gann of Gann Associates. Gann believed that "the best solution to temporary clutter is permanent signs with designed-in readerboards or electronic message centers. Temporary signs exist because businesses and other sign users have a legitimate need to display temporary messages. Doing this on a permanent panel that is physically part of and visually integrated with a good permanent sign may be the most compatible way to do this." Author's Answers to Questions about "Sign Control in Cuyahoga Falls: Regulating Outside the Box" (July 2003 Zoning News), available on the American Planning Association website.

§ 1147.03 (C): Displays prohibited:

b. d. Flashing signs.

c. f. Moving signs.

---

obstruct or detract from the visibility or effectiveness of any traffic signal or control device on streets and roads within the village; or (2) make use of words, phrases, symbols, lights or characters, in a manner as to interfere with, mislead or confuse traffic."

§ 1147.06.A: Rules for Special Signs: Changeable Sign Areas

(i) "1. Sign Area Bonus for Inclusion in Permanent Sign. To meet the need businesses and organizations have for timely and variable sign messages and also to prevent the clutter that can be created by portable signs, the Permanent Sign Allowance of a property shall be increased as provided in Table 1147-4 if a changeable copy area or electronic message center, both as defined herein, of no less than 16 square feet is incorporated into a permanent non-portable Non-Surface Sign on the lot or building site."

(ii) Under Table 1147-4, the lawful surface area of a permanent sign – known as its "permanent sign allowance" – increases by 20 percent if "a changeable copy area or electronic message center is permanently part of a permanent non-portable sign conforming to 1147.06.A.

(iii) 2. Single Electronic Message Center. Electronic message centers shall be allowed only on a single Permanent Sign per lot or building site.

(iv) 3. Integration into Sign. Changeable copy areas and electronic message centers on permanent signs shall be part of the same sign panel as a non-changeable sign and shall be integrated into the face of such sign by use of a border or similar design treatment that provides a visual linkage to the rest of the sign.

(v) 4. Maximum Area. A changeable copy area or electronic message center, both as defined herein, shall be no more than 60 percent of the actual sign area of any permanent sign panel of which it is a part.

(vi) 5. On Temporary or Portable Signs. No temporary or portable sign shall display a changeable copy area or electronic message center.

IV. MICRO LEVEL REGULATIONS — RECURRING ISSUES. ROBIN WOLPERT, GREENE ESPEL PLLP.

A. Key Regulatory Issues

There are severak key regulatory issues regarding dynamic signs, including (1) the appropriate duration of dynamic messages, (2) whether, and under what conditions, to permit motion, animation, and video messages, (3) the appropriate level of brightness of dynamic signs, (4) the appropriate placement and spacing of signs, (5) whether to treat on-site and off-site dynamic signs differently, (6) the appropriate size of dynamic signs, (7) the appropriate text size for dynamic signs, (8) the interval between successive displays, (9) visual effects between successive displays, (10) message sequencing, and (11) the amount of information displayed.

In assessing what regulatory options achieve their policy goals, local governments may consider the safety risks associated with dynamic signs and the costs and benefits of various regulatory options.

This section relies on two resources. First, "Safety Impacts of the Emerging Digital Display Technology for Outdoor Advertising Signs," Jerry Wachtel, (April 2009) and SRF Report for the City of Minnetonka: In connection with litigation regarding dynamic signs in the City of Minnetonka, SRF prepared a report for the City that reviewed selected safety studies, identified the safety risks associated with dynamic signs, and identified regulatory options.

B. Public Safety Risks

Dynamic billboards cause driver distraction and pose risks to public safety.

To assess the safety implications of dynamic and static signs, road safety scholars have examined (1) the relationship between static or dynamic signs and crash rates, (2) how drivers process information and limitations on their ability to process information, and (3) the factors contributing to driver distraction and the risk of crashes.

In general, the results of these studies indicate that dynamic billboards cause driver distraction and driver distraction causes traffic accidents. Dynamic billboards, with their ability to display high resolution color images and changing and moving images, capture the attention of drivers and capture the attention of drivers for longer periods of time than static signs. Indeed, the billboard companies design dynamic billboards precisely for the purpose of capturing the attention of the public and maximizing profitability. When drivers are looking at dynamic billboards, they are distracted and distracted drivers increase the risk of crashes and pose problems for road safety and traffic operations. Driver distraction alone can be the cause of accidents. In addition, driver distraction interacts with roadway conditions, driving environments, weather, and traffic conditions to cause accidents.

C. Regulatory Options For Duration Of Dynamic Messages: What Is The Appropriate Time Interval Between Message Changes? How Should Transitions Between Messages Be Accomplished?

The implications of duration for safety: prior research indicates that the duration of dynamic messages has implications for safety:

1. Glances of two seconds or greater double the risk of crashes or near crashes;

2. Visual fixations on roadway signs decrease as route familiarity increases (but this decrease in visual fixations may not occur with signs that change messages);

3. Dynamic billboards attract more glances and longer glances than static signs and the length of those longer glances (greater than .75 seconds) is close to the minimum perception-reaction time required for a driver to react to a slowing vehicle;

4. Signs with a visual story or message that carries for two or more frames are particularly distracting because drivers tend to focus on the message until it is completed rather than the driving task at hand

5. Due to a Zeigarnik effect (the psychological need to follow a task to its conclusion), the desire to see a message change or read a sequence of messages causes driver distraction and unsafe driving behavior like prolonged glances away from the road, slowing, and lane departure.

Suggested regulatory goals and options:

1. Minimize the Ziegarnik effect (the desire to see a message change) and the driver distraction associated with watching dynamic signs change by setting the duration of sign messages to minimize the chance that motorists will see more than two successive messages. This can be accomplished by determining the sight distance and the prevailing speed for a road on which a billboard appears, calculating the time for which a given billboard will be within the view of approaching drivers, and setting the minimum message duration at that level or greater. Wachtel (Ap. 2009) at 146.

2. Make the interval between successive displays as close to zero as possible so that an approaching driver cannot perceive any blanking of the display screen. Wachtel at 147.

3. Prohibit flashing, spinning, revolving transition methods that are distracting. No visual effects of any kind should be permitted to accompany the transition between successive messages. Wachtel at 147.

4. Reduce driver distraction by prohibiting signs that require or induce drivers to watch a sign for several seconds, such as signs with visual stories, signs carrying messages that are delivered through a sequence of displays, flashing messages (or by limiting such signs to certain driving environments). Message sequencing presented over two or more display devices should be prohibited. Wachtel at 147. This can be accomplished by establishing minimum longitudinal distances between billboards and/or by insuring that minimum message display time is sufficiently long that a driver cannot view more than two such messages on a given passage. *Id.* at 147-48.

5. Reduce driver distraction by insuring that signs are conspicuous and legible.

D. Regulatory Options For motion, Animation, And Video Messages

The implications of motion, animation, and video messages for safety: prior research indicates that:

1. Video and tri-vision signs attract more long glances than static and scrolling text signs;

2. Video and scrolling text signs received the longest average glance duration;

3. Video signs entering into a driver's line of sight directly in front of the vehicle are very distracting;

4. Electronic signs with moving images contribute to driver distraction for longer intervals than electronic signs with no movement;

5. Signs with a visual story or message that carries for two or more frames are particularly distracting because drivers tend to focus on the message until it is completed rather than the driving task at hand;

6. Scrolling messages and sequences of messages increase driver distraction;

7. Flashing messages require more time to read and more time to comprehend and require more of the driver's time and attention.

Suggested regulatory goals and options:

1. Minimize driver distraction by prohibiting video, tri-vision, scrolling text, flashing signs, or any other type of motion in dynamic signs or restricting motion to signs located in certain driving environments.

2. Set a maximum motion time frame based on the length of time a sign is visible for particular driver's speed, speed limits, and traffic volume. See SRF Report at A24-25.

3. Reduce driver distraction by prohibiting signs that require or induce drivers to watch a sign for several seconds, including signs with visual stories, signs carrying messages that are delivered through a sequence of displays, flashing messages.

E. Regulatory Options For The Brightness Of Dynamic Signs And External Illumination

The implications of brightness for safety: brightness can distract drivers and impair their ability to perform driving tasks. Previous research indicates that that the brightness of dynamic signs can temporarily blind a driver or prompt a driver to look away from the light. Other research describes the "moth effect," which is that the eye is drawn to the brightest objects in the field of view and will tend to attract a driver's gaze earlier and possibly longer than other visual stimuli in the environment that appear less bright. Wachtel at 153. Newer sign technologies permit dynamic signs to respond to ambient light conditions, raising additional concerns about the adequacy of those changing brightness levels.

The challenges of brightness regulation: brightness is a measure of the perceived intensity of a source of light. Wachtel at 151. There is no objective definition of excessive brightness because the appropriate level of brightness depends on the environment within which the sign operates. Accordingly, brightness cannot be used as a criterion to regulate the output of digital billboards—the challenge is to establish objective measurable limits on the amount of light that billboards actually emit and set different upper bounds for different environmental and ambient conditions. *Id.*

There are two objective measures of limits on brightness. *Id.* at 152. One is illuminance, which describes the amount of light coming from a light source that lands on a surface. *Id.* Illuminance is measured in footcandles or lux. Luminance describes the amount of light leaving a surface in a particular direction, or reflected off that surface, and can be considered the measured brightness of a surface as seen by the eye. *Id.* Lunimance is measured in candelas per square meter. The difference between the two measures is that illuminance is the lighting of an object while luminance is the light coming from an object. *Id.*

It is difficult to establish a uniformly applicable measure of brightness for all dynamic signs. There is no single luminance level that can serve as a criterion because brightness is dependent on the surrounding environment and the context in which the digital billboard is viewed. Wachtel at 153. In addition, the instruments that are used to measure brightness in the field are currently very expensive and it is difficult to measure brightness in the field. For all these reasons, the enforcement of any brightness regulations is challenging.

Regulatory Options: Wachtel has very detailed recommendations regarding the measurement of luminance, how those methods can be adopted for use by any jurisdiction, and how to measure luminance. *See* Wachtel at 151-158. It is important that in the event of a failure that affects digital billboard luminance, the display will default to an output level no higher than that which has been independently determined to be the acceptable maximum under normal operation. *Id.* at 158.

1. City of Minnetonka: "No sign may be brighter than is necessary for clear and adequate visibility."

2. Prohibit brightness that impairs the vision of a driver or promotes driver distraction.

3. Prohibit brightness that interferes with traffic control devices.

F. Regulatory Options For Longitudinal Sign Placement And Spacing

The implications of sign placement and spacing for safety: previous research indicates that:

1. The number of advertising signs per mile (or road section) is positively associated with crash rates, i.e., the more advertising signs per mile (or road section), the higher the crash rate;

2. Intersections containing advertising signs have a higher crash rate than those containing no advertising signs;

3. Street level advertising signs are more distracting than raised advertising signs;

4. The less conspicuous the sign, the higher the likelihood of an increased crash rate;

5. Signs pose a safety hazard when they obstruct a driver's line of sight at an intersection, curve, or point of egress from an adjacent property or obstruct a driver's view of a traffic control device;

6. Signs pose a safety hazard when they are located where heightened driver concentration is required (high pedestrian volume intersection) or when they are likely to be mistaken for a traffic control device or as an instruction to drivers;

7. Signs with a visual story or message that carries for two or more frames are particularly distracting because drivers tend to focus on the message until it is completed rather than the driving task at hand.

Challenges:

1. Regulating sign spacing can be like starting a game of "musical chairs" because the ability of one company to put up a sign at one location can depend on whether another company has already put up a sign within the immediate vicinity.

2. This can create problems of equity because similarly situated property owners end up with different rights.

3. It can also create a "race" to engage in exactly the behavior that the local government is trying to regulate, because those who are first in the neighborhood to engage in the behavior are the least likely to be burdened by spacing requirements.

Suggested regulatory goals and options:

1. To the extent that federal and state spacing requirements are not already applicable, establish minimum distances between dynamic signs and regulations regarding the sequencing of sign messages to insure that drivers are not visually overloaded and reduce the chances of creating an over-stimulated driving environment. Minimum distances can be calibrated based on the driving environment, sight distance, traffic, speed, topography, and distance. The distance can be calculated based on whether two or more billboards are within the driver's field of view at the same time and whether the unsynchronized changing messages on such

on small signs, features that increase driver distraction. If the sign is too big, the attention of drivers may be captured for lengthy periods of time, diverting their attention from driving tasks. Overly large signs are also more likely to obstruct a driver's ability to see other things, which may include important traffic-control devices and signs.

Regulatory goals and options: there is no standard approach to regulating the size of signs, and there is no standard approach to regulating the size of dynamic signs or the size of the dynamic portion of the sign. Size limitations may be established that reduce driver distraction based on the driving environment in which the sign is located, distance, and legibility goals. The most common size for billboards is 14 by 48 feet in a horizontal format.

I. Regulatory Options For The Text Size Of Dynamic Signs And The Amount Of Information Displayed.

The safety implications of text size:

1. Previous research indicates that the less legible the sign, the higher the likelihood of an increased crash rate. The preferred approach for highway signage is that sign text be 1 inch high to be readable from 30 feet away, and larger text is needed for signs to be legible at greater distances.

2. Sign associations have promulgated "best practices" standards for commercial on-premise signs, with a particular focus on legibility. Because there is generally a common interest between the sign industry and regulators in avoiding signage or text that is too small to be seen and understood in particular locations, those "best practices" standards can be a useful source of potential standards for text size in particular settings.

Regulatory goals and options: to increase legibility, reduce the time needed to read billboards, and reduce driver distraction, local governments can follow the preferred approach used for highway signage or calibrate the appropriate text size based on distance, the driving environment, and the desired legibility.

The safety implications of the amount of information displayed:

1. The more information that is presented on a digital billboard, the longer it will take an observer to read the message and the more likely it will be that drivers will slow to read the message, adversely affecting traffic flow and safety. Wachtel at 148. This concern is exacerbated when a driver wants to memorize or memorialize part or all of a message displayed on a digital billboard. No jurisdiction in the U.S. places restrictions on the amount of information that may be presented on digital billboards. According to Wachtel, the upper limits on the amount of information would vary depending on the sight distance, speed limits, and driver task demands imposed by the design and operation of the highway. *Id.* at 149. Wachtel does not provide a recommendation on policy options on the grounds that it is premature. *Id.*

billboards can distract by conveying the appearance of flashing. Wachtel at 158. Longitudinal spacing requirements should be calculated so that a driver is not faced with two or more digital billboard displays within his field of view at the same time. *Id.* This minimizes the risk of distraction and ensures that a flashing effect will not occur. *Id.* at 159.

2. Decline to supplement federal and state standards to promote fairness and avoid creating additional incentives to race to apply dynamic technology to existing static signs.

3. Limit or prohibit dynamic signs at intersections, in demanding driving environments, and in places where they obstruct a driver's view.

4. Limit or prohibit dynamic signs that resemble traffic control devices.

G. Regulatory Distinctions Between On-Site And Off-Site Signs

On-premise signs, which advertise products or services that are available on the property on which the sign is located, can be just as distracting as off-premise signs. As the cost of digital technology declines, many roadside businesses are increasingly installing digital billboards. These signs can be more distracting than off-premise signs because they may display animation, full motion video, and sound and may be constructed at elevations closer to the road and closer to drivers' eye level. Wachtel at 161. They may be placed in the right of way and close to traffic control devices. Under these circumstances, there may no longer be any reason to treat them more favorably from a regulatory standpoint.

The safety implications of on-site and off-site signs: previous research does not indicate that on-site and off-site dynamic signs pose distinct safety risks that warrant differential regulatory treatment. However, because on-premises signs are more likely to serve wayfinding purposes, if on-premises signs are illegible or otherwise hard to see from a safe distance, there may be a risk that they are seen too late by drivers who are trying to find their way to a particular location, and who then engage in dangerous maneuvers and lane-changes to leave the road. Local governments need not view advertising and wayfinding as equally important goals, and for that reason may choose to adopt policies that benefit the use of signage for wayfinding while burdening its use purely for advertising.

Regulatory goals and options: local governments may choose to regulate all dynamic signs equally, without regard to whether they on-site or off-site dynamic signs. Local governments may still choose to regulate on-site and off-site signs differently even if they do not regulate on-site and off-site dynamic signs differently.

H. Regulatory Options For The Size Of Signs

The safety implications of sign size: previous research indicates that dynamic signs pose safety risks primarily by distracting drivers. The size of signs or the size of the dynamic portion of signs may be distracting because the size is too big or too small. If the size is too small, then drivers must take more time to read the sign, diverting their attention from driving tasks. In addition, advertisers have an interest in frequent message changes and using sequenced messages

J. Annual Operating Permits

Oakdale, Minnesota grants annual permits to operate digital billboards and the permit must be renewed each year. This enables the City to maintain oversight over sign operation and facilitates updating regulations to fit with new uses of digital technology.

V. CONSEQUENCES OF CAP AND TRADE AGREEMENTS INVOLVING DIGITAL SIGNS. WILLIAM D. BRINTON, ROGERS TOWERS, P.A.

There has been a great deal of activity by the outdoor advertising industry in approaching local governments with proposed deals involving conversion of existing static billboards to digital billboards in exchange for the removal of other billboards.

There have been a variety of outcomes.

1. Some cities have refused this invitation. Those communities are usually ones that have placed a high priority on improving the aesthetics of their communities, and prefer an approach of gradual attrition of unwanted billboards. The introduction of new or digital-upgrades of existing billboards - which would be more of an eyesore - would not be worth an acceleration in the removal of other, older billboards in their view. This has been the recommended course of action by the scenic community and by those with substantial experience in opposing the outdoor industry on public policy grounds or in the courts. In addition to the emerging issue of traffic safety, there is also a risk of undermining the purposes of other sign code provisions when allowing digital non-accessory (off-site) signs which may lead to threats of litigation and stymie efforts to improve an overall sign code.

2. Some cities have accepted this invitation. The issue then becomes a negotiation over numbers and locations. Some cities have looked to the financial aspects of the proposed trades to ensure that there is not a windfall for the industry by agreeing to a bad trade. Those cities that want to avoid long-term consequences of such a deal have placed a time limit on duration of a digital addition to the landscape, i.e., a date upon which a new or converted digital has to be removed.

3. Some cities appear to be unaware of (1) the downsides to accepting a proposed conversion to digitals and (2) the opportunity to secure the removal of a significant number of unwanted billboards as part of a trade, coupled with a sunset date for the new/converted digital billboard.

ATTACHMENT "I"

April 2009 Wachtel Report

Safety Impacts of the Emerging Digital Display Technology for Outdoor Advertising Signs

FINAL REPORT

Submitted Under NCHRP Project 20-7 (256)

Prepared by Jerry Wachtel, CPE
President, The Veridian Group, Inc.
Berkeley, California

April, 2009

ACKNOWLEDGEMENTS AND NOTES

The author is grateful to the members of the peer review committee. Their thorough review of this paper, during its initial draft stage and again when the draft final report was submitted to them, pointed out numerous errors, weaknesses, and statements in need of clarification or documentation.

We have tried to make all the suggested corrections, and to incorporate all of the changes recommended by the reviewers. Several commenters offered suggestions that were excellent and appropriate, but could not be accommodated in the body of the actual paper. They are mentioned here, with our thanks and concurrence.

It was proposed that FHWA offer a short course for traffic engineers to understand the human factors issues associated with outdoor advertising signage, to assess the existing roadway environment for safety issues, and how to work with local businesses to improve signage and safety at the same time. We agree that this is an excellent and timely suggestion.

It was recommended that roadway signing and human factors (MUTCD) experts should be collaborating with the advertising industry to promote signs and their placement with appropriate lettering and symbol guidelines or standards that will increase readability while minimizing distraction. In a similar vein, future research should address DBB design criteria that will provide travelers with needed information while at the same time minimizing driver distraction. We note that such collaboration has existed between human factors experts and the on-premise sign industry, but we are not aware of any such relationships in the billboard (off-premise) field.

Another reviewer proposed that TRB conduct a Webinar on this topic in the future. This, too, would provide an excellent forum for the dissemination of this, sometimes arcane, information, in a manner that has practical applications.

Reviewer #5 proposed an interesting thought experiment that addressed the difference between the question: "What is the statistical relationship between digital billboards and traffic safety?" and the question: "Are accidents more, less, or equally likely to occur near digital billboards compared to conventional billboards?" The reviewer suggests that these two questions are not necessarily incongruent, as we stated in the report, and that the second question is both technically correct (as is the first), and more *useful* because it addresses the safety issue in a manner closer to real-world driving; i.e. with the recognition that conventional billboards are a given part of the landscape. While we do not disagree with the reviewer's position, we question the underlying assumption that the presence of conventional billboards is the accepted and acceptable norm. Most of the research reviewed for this report studied driver distraction and other safety-related measures with real-world or simulated conventional billboards, and many of these studies (as have studies going back decades) identified safety concerns; the fact that control and enforcement may be lax should not de facto make the presence of these billboards the accepted baseline. As well, there are several States and local jurisdictions that ban all

billboards, so this baseline is not universal, even in the US. But our greatest concern is with the industry's efforts to raise the bar that research must be meet before, in their view, digital billboards could be found to have adverse traffic safety impacts. The study by Lee, et al., discussed at length in our report, compared digital billboards, not only to conventional billboards, but to "comparison" sites. When the research demonstrated that driver eye movements and vehicle control issues were similar between the DBBs and these comparison sites, the authors proclaimed the digital signs "safety neutral" because, as they defined them, the comparison sites contained "items you might encounter in everyday driving." But a careful reading of the report shows that these sites included digital on-premise signs, tri-vision signs and video boards. In other words, they were rather the same as DBBs, except that they included on-premise signs. In our opinion, this subtle "criterion creep" is unprofessional and inappropriate.

EXECUTIVE SUMMARY

In July 2007, the Highways Subcommittee on Traffic Operations (SCOTE) of the Association of State Highway and Transportation Officials (AASHTO) issued a proposed policy resolution on outdoor advertising. This document recognized that inattentive driving was a major contributor to highway crashes, and that new technologies were enabling the outdoor advertising industry to display more attention-getting messages that were likely to cause drivers to be less attentive to the driving task. The document further noted that national interest and concern about the safety implications of these advanced outdoor advertising displays had been expressed by FHWA and TRB as well as by State and local government agencies. Because the subcommittee recognized the potential safety implications of such signs and the lack of "substantiating evidence" for determining appropriate guidelines for their control, SCOTE resolved to support the undertaking of research as quickly as possible into the safety and operational effects of these technologies and to forward its resolution to the AASHTO Standing Committee on Highways to be considered a high priority project for consideration by the Standing Committee on Research of the National Cooperative Highway Research Program (NCHRP). The SCOTE resolution became a Research Problem Statement [(NCHRP 20-7 (256)], which led to the undertaking of this work in February 2008.

The specific objective of the study was to develop guidance for State Departments of Transportation and other highway operating agencies with respect to the safety implications of digital display technology being increasingly used for outdoor advertising signs. The objective was to be achieved through the conduct of a critical literature review of existing guidelines and research results, including, separately, research undertaken and published by the outdoor advertising industry; an identification of the human factors elements related to the operational characteristics of such signs; a review of the experiences of other countries with this outdoor advertising sign technology; and the preparation of a final, peer reviewed, report documenting the work conducted and including recommended guidance related to the safety aspects of digital display technology for outdoor advertising signs.

Earlier reports published by FHWA in 1980 and 2001 had extensively reviewed the research literature in the field of outdoor advertising, and an FHWA study that ran concurrently with this project also included a review of the more recent research literature. The goals of the FHWA study, however, were quite different than those of the project reported here. Whereas this study had as its objective the development of guidelines that State and local government agencies could adopt immediately, the FHWA study sought to identify unmet research needs with regard to the potential impact of these signs on driver attention and distraction, and to propose a research strategy to fill these knowledge gaps. Thus, the two studies, conducted concurrently, were complementary - this one seeking to develop readily useable guidelines that could be implemented at the State and local level based on our existing knowledge base, and the other seeking a more comprehensive understanding of the safety implications of these signs that might lead to guidance and/or regulation at the Federal level.

Because the technologies used in the signs of interest in this report are relatively recent, and because these technologies have advanced quickly in key performance characteristics (e.g. brightness, resolution, off-axis viewing) and have become much more affordable in recent years, research, too, has increased dramatically since the 2001 FHWA report. Indeed, of the 150 references cited in this report, more than 20 represent original, empirical research, conducted roughly within the past decade, that directly or indirectly address the potential for driver distraction from outdoor advertising signs. Ironically, and consistent with the research studies cited in the prior FHWA reports, the technology continues to lead both policy and research, and only a small number of these studies actually dealt with these advanced digital display technologies. Such research was, however, sponsored by government agencies as well as industry, in the laboratory and in the field, using controlled experimental techniques as well as statistical analysis of crash summaries. In addition to research conducted in the US, the report reviews studies performed in England, Scotland, Finland, Australia, Canada, South Africa, Brazil and The Netherlands. Because of the complexity of the issue, the number of variables present in every real-world situation, and the difficulties of statistical and methodological control in the conduct of such research, we have attempted to make our review of the literature critical as well as comprehensive.

Several conclusions can be drawn from the extensive literature on this topic. First, there are strong theoretical underpinnings in the psychology of cognition, perception, psychophysics, and human factors, to suggest why stimuli such as roadside digital billboards can capture and hold a person's attention, even at the expense of primary task performance. Second, it is difficult to perform a study in this domain that does not suffer, at some level, from weaknesses that may affect the strength or generalizability of its findings. Third, the research sponsored by the outdoor advertising industry generally concludes that there are no adverse impacts from roadside digital billboards, even when, in one case, the actual findings of such research indicate otherwise. Conversely, the conclusions reached in research sponsored by government agencies, insurance companies, and auto safety organizations, especially in those studies performed in the past decade, regularly demonstrate that the presence of roadside advertising signs such as digital billboards, contributes to driver distraction at levels that adversely affect safe driving performance. Fourth, the recommendations from research, and the existence of guidelines or regulations that stem from that research, are quite consistent, although not fully so, both in the areas in which digital billboards are suggested for control (e.g. brightness, message duration and message change interval, and billboard location with regard to official traffic control devices, roadway geometry, and vehicle maneuver requirements at interchanges, lane drops, merges and diverges), and with regard to the specific constraints that should be placed on such signs' placement and operation. Several countries have developed comprehensive, thoughtful policies for control of roadside advertising, and their efforts can serve as models for State and local governments within the US. A number of US counties and cities, too, have developed policies and regulations for the control of digital outdoor advertising that comport with the research. In some cases, such local regulations are forward looking, in that they address technologies, or applications of technology, that are not yet in widespread use.

During the course of this project, we identified several recent extensions of digital advertising technologies that may add further to the distraction potential of these displays. The growing use of LED technology for advertising in on-premise applications is of concern because such signs may be larger than traditional billboards, closer to the right-of-way and to roadway sections with high task demands, and may include animation and full motion video. At least one State is considering the use of its official changeable message sign network for the display of digital advertising. And an unknown number of private or toll-road operators are also contemplating the sale of advertising within their rights-of-way. In addition, we are seeing the deployment of LED displays, often featuring video, on vehicles moving in the traffic stream. Vehicles as diverse as small trucks and vans, public transit buses, and large, over-the-road trailers, are now being outfitted with LED advertising, and the potential for driver distraction grows with each such installation. Our review suggests that, with few exceptions, government agencies have no regulations or guidelines in place to address these new uses. The newest digital billboards are also increasingly capable of "interacting" with approaching drivers. In some cases, the Radio Frequency Identification Device (RFID) embedded in a vehicle's key or on-board computer system, can trigger a personalized message on a digital billboard; in other cases, the billboard can display a message tailored to the radio frequency of passing vehicles. Still other billboards encourage drivers to interact with the sign by texting a message or calling a number displayed on the billboard. A patent that incorporates cameras mounted to billboards, together with eye-movement recording devices, claims to be able to capture images of drivers, and their eye movements, as they approach the billboard. Our review has not identified any government agencies, in the US or abroad, that have addressed these new technologies or their applications.

The report consists of ten parts. After an introduction and background presentation in Section 1, the literature in the field is comprehensively and critically reviewed. General research is discussed in Section 2, and research sponsored by the outdoor advertising industry is presented in Section 3. The key human factors issues that inform the potential response of drivers to digital roadside billboards are summarized in Section 4. Section 5 of the report reviews a representative sample of guidelines and regulations that currently exist in a number of foreign countries as well as in several jurisdictions within the US. This is followed by a series of recommendations for potential regulations and guidance in Section 6. These recommendations are those that (a) have worked elsewhere, and (b) are based on sound research or science, and therefore might have practical applications for those jurisdictions seeking guidance to inform their own decision-making. Section 7 addresses issues of digital advertising on-premise and on right-of-way. Section 8 discusses some of the newest roadway-related applications of computer-controlled LED advertising that have begun to appear on and adjacent to public roads in the US and abroad, and for which little policy has yet been considered. Section 9 summarizes the report's conclusions, and Section 10 presents the list of references cited in the body of the report.

SECTION 1.

INTRODUCTION AND BACKGROUND

Nearly 30 years ago, the Federal Highway Administration (FHWA) published the first comprehensive review of the literature on the safety impacts of electronic billboards. FHWA, through the Highway Beautification Act, had, and still has, the authority to regulate off- premise advertising signs (billboards) adjacent to Federal Aid Highways, and these regulations prohibited, in part, any signs that utilized "flashing, intermittent, or moving lights" (Wachtel and Netherton, 1980, p. 16-17). In the late 1970s, the sign display technology in common use permitted little more than digitally displayed time and temperature information, although some signs could display several lines of text and crude, cartoon-like graphic images. Even then it was possible to change the displayed sign messages simply and quickly in real time, and it was possible for these signs to display a number of different visual effects, such as fade, dissolve, flash, and others. The billboard industry took the position that signs using this technology did not present any of the visual characteristics prohibited in the FHWA regulations, and, therefore, should be permitted under the existing regulations. Because the manufacturers of such signs and their potential users saw a bright future for this technology, and because of FHWA's concern about their potential to distract drivers, the industry presented its case to the U.S. Congress. As a result, the FHWA Office of Research was asked by the agency's Office of Right-of-Way to investigate what was known about such signage when used for roadside advertising, in anticipation of a possible update to the agency's regulations. The product of this effort was a comprehensive and critical review of all available literature in the field, some dating back 30 years or more. Wachtel and Netherton termed these new signs "commercial electronic variable message signs," or "CEVMS." Because this technology was so new, the authors found little research that had been done with such signs, and therefore had to rely on research that had been conducted with traditional, fixed, billboards. As a result, although they were able to identify specific safety issues and concerns raised by CEVMS, especially when combined with their review of accepted psychological principles of attention, the authors suggested that additional research was needed, and recommended a specific program to accomplish this. Unfortunately, the proposed research was not pursued.

In 2001, with outdoor advertising signs using newer, more powerful technologies, and capable of much higher fidelity displays with higher luminance levels and immediate wireless display and message updates transmitted remotely, FHWA undertook a follow-on project to bring its understanding of the state-of-the-art and –practice up to date, and to again propose a direction for research. Although this study did not undertake a critical review of the literature, it brought to bear recent research and psychological constructs on inattention and distraction. The product of that work (Farbry, et al., 2001), in conjunction with the earlier document, became the basis for a preliminary, scoping, research study by FHWA (Molino, et al., 2009), and a follow-on research study that was recently initiated.

The 1980 project reported that several of the identified research studies had identified a relationship (correlation) between the presence of billboards and crashes, whereas several other cited studies found no such relationship. Wachtel and Netherton, with the assistance of an FHWA statistician who reanalyzed the data reported in a number of these early research studies (Weiner, 1979) concluded that those research studies that had been more rigorously designed, controlled, conducted, and analyzed, seemed to suggest that a relationship between roadside billboards and traffic safety was present, and that safety was adversely affected by such billboards. The findings pointed to an adverse effect when billboards were bright, close to the roadway, and visible to approaching drivers for considerable distances; and when they were located near intersections, interchanges, or horizontal curves. Further, when the driver's task demands were elevated, as might be the case in heavy traffic, adverse weather, or with challenging traffic movements (lane drops, merges, etc.), the more robust research seemed to show the potential for adverse safety impacts from roadside billboards.

During the 20 year gap between the publication of the first two FHWA studies, as well as more recently, a number of other researchers have reviewed the same early studies (along with more recent studies that have since become available), and reached essentially the same conclusions. (See, for example, Bergeron [1996a], Wallace [2003]). In fact, only one researcher (Andreassen, 1984) is known to have reviewed this literature and reached the conclusion that there is no linkage between roadside billboards and traffic safety, and his colleagues at the Australian Road Research Board (now ARRB Transport Research) (Cairney and Gunatillake, 2000) have expressed strong disagreements with his conclusions.

The latest LED technology enables roadside billboards (and on-premise signs using the same technology), to (a) present images, symbols and characters that are extremely bright (such that they can be easily viewed in full sunlight), (b) with visual fidelity on a par with broadcast video, (c) on displays that can be changed instantly and kept on the screen for as long (or short) as desired, and (d) on signs that can be much larger than traditional 14 ft. by 48 ft. billboards.[1] As a result, the question has again arisen as to whether and how these signs should be regulated in the US. Presently, the States are asking FHWA for guidance. While it proceeds with its current research project FHWA has issued interim guidance that addresses characteristics of CEVMS including: message duration, transition time, brightness, spacing, and allowable locations (Shepherd, 2007). Unfortunately, these guidelines are based on little sound empirical data, and, in several cases, are so subjective as to be open to multiple interpretations.

As suggested above, the potential impact from these latest technologies goes far beyond a simple replacement of traditional, static billboards. On-premise advertising signs, traditionally given much more freedom by FHWA and local authorities, are increasingly using the same LED technology now appearing on billboards. Shopping centers, auto malls, and many other local businesses are finding that such signs are affordable, and that the display capabilities they offer are unprecedented in their attention-getting power. In

[1] One on-premise sign in New York City measures 90 ft. by 65 ft. and is mounted 165 feet above grade where it is visible for two miles from the adjacent Interstate highway (Business Wire, 2002).

addition, these technologies are now beginning to appear on moving vehicles, and some LED billboards can tailor a "personalized" message to approaching traffic by "reading" the digital signal produced by in-vehicle entertainment systems, RFID keys, and other devices. Our research suggests that such alternative, increasingly powerful and compelling uses of the newest technologies for outdoor advertising to the traveling public will continue to evolve at a rapid pace, and that regulators must be prepared to deal with these developments. This paper, however, is limited to a discussion of traditional billboards along the roadside, albeit those with the latest technological capabilities. Although some such signs use scrolling characters across a screen, and others use rotating panels (called Tri-Vision or Roller-Bar signs), it is the LED technology that has the greatest potential for capturing attention, and therefore, distracting the driver. Whether such signs are called digital billboards (DBBs), electronic billboards (EBBs) or CEVMS, they refer to the same types of signs.

Because of the pressures being put on State and local Governments to issue permits for DBBs, and because of the threat of litigation should such permits be denied or revoked, the States have asked for an update about the state of knowledge that results from the latest research. In addition, the States would like to know what guidelines and/or regulations exist in other jurisdictions with regard to DBBs, and have asked for recommendations for appropriate, realistic, data driven guidelines that they might consider adopting for their own streets and highways, and pending updated guidance from FHWA.

The present report, therefore, represents a comprehensive, critical review of the most recent research literature in this field. To a large extent, the research discussed herein has been conducted since the most recent (2001) FHWA report was published. Several earlier studies are discussed, however, either because they were not captured in the two FHWA reports, or because their methods and findings are directly relevant to the questions now being asked. A number of these studies have not been widely reported or are controlled, internal documents. We are grateful to their authors for making them available to us.

After the critical literature review in Section 2, subsequent sections of this report address: research performed on behalf of the outdoor advertising industry, human factors considerations relevant to driver response to these technologies, guidelines and regulations in place or under consideration in other jurisdictions, recommendations for guidance that States and local governments might adopt in the near term, and new technologies and applications for outdoor advertising. After a brief summary, the final report section identifies the references cited in this study.

SECTION 2.

REVIEW OF THE LITERATURE.

The review and critique of the studies below are presented in chronological order. As requested in the Research Problem Statement that led to this study, research undertaken and published by the outdoor advertising industry is treated separately. These studies are discussed in Section 3, Industry Sponsored Research.

Perception Research Services, 1983.

This paper is discussed in Section 3, "Industry Sponsored Research."

Cole and Hughes, 1984

The authors conducted a series of experiments in which 50 participants drove a vehicle along a predetermined route in Melbourne, Australia. Prior to the data collection, the authors placed a series of 35 disc targets along the route. These discs were of three different sizes and three different reflectances. They were positioned where typical traffic signs would be likely to occur. The participants were divided into two different groups at random; each group was given slightly different instructions. Group A received instructions oriented toward *attention conspicuity*, whereas Group B received instructions oriented toward *search conspicuity.*[2] Results showed that the hit rate, the frequency with which the disc targets were reported, was three times higher in Group B than in Group A, demonstrating the benefits of directed search. It was also found, however, that directed search produced its greatest benefits when the targets had low attention conspicuity, and showed the least gains for targets with high attention conspicuity. Although early efforts to define conspicuity tended to consider it to be strictly a quality of the object, more recent work, such as this study, have demonstrated that conspicuity cannot be measured independently of the observer's state of attention.

Several other findings from this study are relevant to our present project. The first is that the angle of eccentricity of the object to the viewer's line of sight is an important factor in its conspicuity; more so than the object's size or reflectivity. Second, the authors found that the visual environment in which the target was located was an important contributor to its conspicuity. They suggest a thought experiment to demonstrate that the predominant location factor that affects conspicuity is visual clutter. In the case of attention conspicuity, for an object in the periphery of the visual field to command attention, it will first provide a stimulus to the eye that is strong enough to arouse the viewer's attention and generate an eye movement toward the object to move the object into central (or foveal) vision, where it is fixated. This action, which the authors describe

[2]Cole and Hughes define attention conspicuity as the capacity of an object to attract attention when the object is unexpected; and search conspicuity as the property of an object that enables it to be quickly and reliably located by search.

as a quasi-reflex(ive) response, is known as an *optically elicited eye movement*. The authors argue that visual clutter adversely affects both search and attention conspicuity equally, because the clutter causes a loss of prominence of the target object, thereby reducing both the attention-getting quality of the object and its accessibility to visual search.

What is the relevance of these findings to our present concern with DBBs? First, since billboards are most likely identified through the process of *attentional* rather than *search* conspicuity, it suggests that it is this semi-reflexive behavior of the optically elicited eye movement that first brings a billboard into a driver's visual attention, and that the owner of a billboard would prefer to locate it in an area that is otherwise low in visual clutter. Second, it suggests that billboard designers are likely to design their messages in such a way as to make them as conspicuous as possible, both to stand out from their competitors and to successfully trigger this reflexive eye movement to move the image or message on the billboard into a driver's foveal vision. Third, it is understood that billboards are, by definition, contributors to visual clutter in the driving environment, and, as such, they are likely to contribute to a degradation of search conspicuity of official traffic signs, signals and markings, as well as other traffic, obstacles, and hazards, which become conspicuous to drivers as a result of such directed search. Finally, the reported finding that the degree of eccentricity of an object to the driver's line of sight is an important contributor to its conspicuity lead Cole and Hughes to suggest that: "in order to achieve conspicuity, the designer is better advised to locate the target where it will have a small eccentricity to the observer's line of sight…." Small angles of eccentricity are afforded by minimizing lateral offset and by ensuring a long observation distance" (p. 310). An understanding of this concept may contribute, along with other factors, to the desire of the billboard owner to locate such signs as close to the road edge as possible, and along horizontal curves and tangent sections that afford potentially longer sight distances for approaching drivers.

Young, E. 1984.

This paper is reviewed in Section 3, "Industry Sponsored Research."

Pottier, A. 1988.

The impetus for this research study was a series of findings from three prior studies that demonstrated that the conspicuity of road signs depends on the visual environment in which they are located. Pottier notes that road signs are frequently located in settings that make them less conspicuous due to extraneous elements that she calls "static visual noise." She defines visual noise as "constant background noise derived from a multitude of cues, interfering with or preventing the driver from processing the information from the cue significant to him" (p. 581). She considers "billboard advertisements" to be a type of visual noise.

Pottier evaluated the abilities of twelve participants to detect the shape and location of a number of official traffic signs, as quickly as possible, under four different test conditions. These conditions included: (a) a simple or complex visual environment; (b)

different shapes (three) and sizes (three) of the signs; (c) different degrees (three) of eccentricity from the central point of fixation; and (d) different time periods (three) in which the signs were visible. Eye movements were recorded as well. Some of the findings of this study were as expected – specifically, that longer observation time improves detection performance, larger signs are more easily detected than smaller ones, and certain shapes (circle and triangle) are more easily detected than others (rectangle).

For our present purposes, the most relevant findings were related to the visual angle from which road signs were most easily detected. Pottier found that, when there was no visual noise in the (simulated) environment, the optimal detection zone was located between zero and ten degrees (0°- 10°) from the participant's central point of fixation; however, in the presence of visual noise, this optimal detection zone shrunk to zero to four degrees (0° - 4°) from the fixation point, regardless of the time available for observation. A related finding was that, when a road sign is "superimposed" on a component of visual noise, "the latter prevents the former from being detected" (p. 582), and the greater the distance between the visual noise and the highway sign, the greater the conspicuity of the sign. The author's conclusion is that "visual noise reduces the functional field inducing a kind of 'tunnel vision' for the driver" (p. 582). Pottier's work foreshadows more recent research in visual clutter (see, for example, Edquist, 2009) which demonstrates that relevant targets (such as official traffic control devices) take longer to find, and that responses to such signs are more error-prone, when visual clutter is high.

Transportation Environment Consultants (TEC), 1989

This "Review of Roadside Advertising Signs" was prepared for the Roads and Traffic Authority (RTA) of New South Wales, Australia. At the time this project was begun, the RTA did not "encourage" advertising signs within the "road reserve" of "classified roads." The Authority had been repeatedly approached by the advertising industry, which submitted proposals for "well designed modern technology advertising sign displays" on road reserve locations and buildings on property owned by the Authority. Because of the potential for such signs to generate revenue for RTA programs, TEC was engaged to investigate the appropriateness of the RTA allowing or supporting such signs in the future. A multi-part study was undertaken, which addressed many aspects of outdoor advertising, including environmental design, aesthetics, town planning, tourism, revenue potential, marketing of road safety promotions, and others. This review will address only the safety and human factors aspects of the project.

The authors briefly reviewed nine studies that dealt with the safety aspects of outdoor advertising signs, and quoted extensively from the early FHWA report on this subject (Wachtel and Netherton, 1980). In addition, they conducted interviews with members of the outdoor advertising industry and experts from the Australian Road Research Board (ARRB).

Their conclusions from these activities include the following:

- Research confirms the limited processor capacity of a driver.

- It is important that management of stimuli to the driver, both inherent to the primary task of driving and external to it (distraction) must clearly aim not to exceed the optimum rate for safe and efficient driver performance.
- When these external stimuli fall significantly below optimum, driver performance may decrease (boredom), and additional external stimuli could benefit driver response.
- Additional attentional loading by advertising signs may impair driving performance when high levels of attention and decision making are required.
- Advertisements not associated with navigational and services information needs can, subject to relevant safety controls, be permitted at roadside locations where the driving task does not heavily load the attentional capacity of the driver.

Interestingly, they reported from their interview with a Dr. S. Jenkins of the ARRB, his recommendation that "changeable message signs could be used in roadside advertisements providing each message is 'static for about 5 minutes' (i.e. the message on-time) and the changeover period between messages 'does not exceed about 2 seconds'" (p. 39).

In a later chapter of the report, the authors provide a series of "definitions and technology" (p. 49) to describe the different types of advertising signs that might be considered, and how they might be used. In a section on "internally illuminated signs" the authors provide a table showing what they consider to be the maximum luminance levels of advertising signs of different sizes which may be located in different driving environments. These data are based on recommendations from the Public Lighting Engineers in the U.K. With regard to "electronic variable-message signs" the authors devote several pages to defining terminology and identifying "factors" that should be taken into account when considering their impact (pp. 56-60). This discussion is taken directly from the Wachtel and Netherton (1980) report (pp. 68-74), and need not be repeated here.

Brown, 1989

After a brief but useful review of the relevant literature, Brown describes the purpose of his study as: "to assess the momentary distractive effects of electronic billboards on driving performance" (p.3). He used a laboratory setting in which the driving task was represented by a tracking task in which the participant had to move a joystick to track a target spot which moved in pseudorandom fashion within a constrained area on the screen. This task was superimposed on a continuous video image of a moving road scene. The distracters were a series of white on black "advertising signs" presented in the lower left area of the screen, overlapping the road and shoulder, and directly adjacent to the screen area used for the tracking task. Sixty different signs were each displayed for two seconds, at a rate of one sign every six seconds. Three different experiments were conducted under the same basic conditions, in which a secondary task (response to a red signal) was present or absent, and in which the advertising signs appeared in a fixed position or were "scrolled" onto the screen. The author found no

effect of the presence of the advertising sign alone on tracking performance, but did observe a negative effect on performance when a secondary task was required.

In discussing possible reasons why the advertising signs alone did not distract the drivers and impair their performance, Brown suggests that, as demonstrated in prior research (Gasson and Peters, 1965), concentration on a central task can lead to an effective reduction in the size of the visual field. In other words, because the principal tracking task in this study required a higher level of concentration than that of a normal driving situation, it might have led to a reduction in the participants' awareness of the images presented in their peripheral vision (i.e. the simulated digital billboard), leading to a failure to notice them. This postulation is similar to the recent findings of Chan et al. (2008), where the authors reported that objects that are not fixated or attended to receive little cognitive processing, and that reduced attention to such objects impairs the speed of identification.

Although this argument can be used to explain why, when a driver concentrates on the driving task by attending to the forward roadway view, he or she may not be distracted by a billboard, the reverse may also be true. That is, a highly attention getting billboard, or one conveying a message of high salience to a driver, may assume a degree of primacy for that driver such that the billboard, and not the road and traffic ahead, becomes the central focus. With a driver now attending to a visual object in the periphery, the forward view may temporarily assume the periphery position, and attention to it may be delayed.

There were a number of limitations to this study, several of which are identified by the author. One stated weakness was that the motion in the video scene and sign presentation was not linked to the tracking task, and thus could be ignored by participants. Additionally, we have concerns that the appearance of the "electronic billboards" which were represented in the simulation by simple white on black text presentations is quite different than the bright, dynamic properties inherent in real-world DBBs. Also, the distracter signs were located in the participants' field of view directly adjacent to the target tracking task and at the road edge, thus not requiring the driver to look away in order to observe these signs. The fact that the study participants could visually observe the billboards and the forward view simultaneously could account for the negative findings.

Rahimi, Briggs, and Thom, 1990

These authors were concerned primarily with the over involvement of motorcycles in fatal crashes with automobiles, and with the results of prior research showing that the predominant cause of such crashes was the car driver's violation of the motorcycle's right-of-way. Further, one driving situation accounts for the majority of such crashes; that is, where the car driver executes a left turn directly across the path of an oncoming motorcyclist. In many of these cases, the car driver claims not to have seen the motorcycle. The authors wanted to investigate the hypothesis that left turns at "busy" intersections would heighten the likelihood of such crashes compared to left turns at "quiet" intersections. In addition, they wanted to test the viability of a new eye/head

movement data collection system that they had developed. A full explanation of this data recording and analysis system is beyond the scope of the present paper. In brief, however, their approach involves the simultaneous recording and time synchronization of drivers' head and eye movements with the visual scene presented to the driver, which is recorded with a separate camera. In the laboratory, the eye/head movement recordings are embedded into the scene video, enabling the researchers to know with precision the driver's head and eye position throughout the drive. Because this was a pilot study, only one test subject was used, and this male, 33 year old driver with 20/20 vision drove a vehicle through a sequence of 40 left turns, alternating between previously selected quiet and busy intersections. The principal differences between the two intersections were in the number of dynamic and static distracters. The pattern of head and eye movements differed significantly at the two intersections. At all 20 trials at the busy intersection, head movements were identified as "straight ahead toward left (SATL)" and at 17 of the 20 quiet intersections, head movements were categorized as "left-right-left (LRL)." Although the driver's head position remained consistent across intersection types, eye movement frequency at the busy intersection was nearly twice as high (significant at the .004 level) as at the quiet intersection. The authors conclude that the two different types of intersections place different constraints on driver behavior. At the quiet intersection, the environment is searched systematically with a combination of head and eye movements. At the busy intersection, however, a stationary head position occurs with frequent and rapid eye movement activity to identify targets and distracters. Their analysis indicated that "the busy intersection contains potential for information overload" (p. 273), and they imply, although do not state, that "busy" intersections, such as those with environmental targets and distracters, may contribute to a greater percentage of automobile-motorcycle intersection crashes due to driver distraction than "quiet" intersections. Although we can't fault the study methods used since this was a pilot study to test a new data recording system, the findings, based as they are on only one participant, should not be generalized beyond the immediate circumstances of this study. Nonetheless, conclusions that demonstrate a correlation between numerous distracters at intersections and poorer driver performance have been shown in several other studies (see, for example, Holahan, et al., 1979).

Wisconsin Department of Transportation District 2, Freeway Operations Unit (1994).

This study tabulated and analyzed crash rates for eastbound and westbound segments of I-94 in the vicinity of County Stadium (since demolished) near Milwaukee, Wisconsin. An electronic billboard began operation on April 13, 1984. Crash rate data was collected for approximately three years prior to sign operation (from 1/1/81) until three years after operation began (12/31/87). Effects were broken down by type of crash (side-swipe, rear-end). Data were analyzed for the one year after the sign became operational, to analyze any novelty effect, as well as for the three year periods before and after the sign became operational. Crash rate was calculated as number of crashes per million vehicle miles of travel (VMT).

The sign is described as a variable message sign that changed images on average 12 frames per minute. This suggests that each image was displayed on the sign for five seconds. No information is provided as to the sign's display technology, brightness, or method of change. It is not known, for example, whether message changes occurred instantly, or whether some visual special effects, such as wipe, dissolve, etc., were employed. Neither the size of the sign nor its height above grade is specified. The sign is obviously two-sided since it is visible to both eastbound and westbound traffic. It is located adjacent to the westbound traffic lanes.

The study used the crash rate in the three years prior to the sign's operational date as the baseline. Findings showed that for eastbound traffic, total crashes increased by 43% in the first year, and 36% over the three year post-operational period when compared to the baseline condition. In the same periods, side-swipe crashes increased 80% and 8%, and rear-end crashes increased 60% and 21%. For westbound traffic, total crashes decreased by 12% in the first year, but increased by 21% over the three year post-operational period. Sideswipe crashes increased 123% in the first year, and 35% over the three year interval, whereas rear-end crashes decreased 29% in the first year, and then increased by 35% over three years.

The author posits two reasons why westbound crashes were generally lower than those for eastbound motorists. First he describes a merge area for westbound drivers caused by northbound and southbound traffic on US-41 merging onto westbound I-94, and states that the roadway configuration causes this traffic to slow as it enters the area, thus reducing congestion through what he describes as "metering." Second, the author indicates that the sign was more readable to eastbound than to westbound traffic.

The author concludes that "it is obvious that the variable message sign has had an effect on traffic, most notably in the increase of the side-swipe rate," and suggests that "it may be beneficial to introduce traffic responsible variable message signs into the area. Signs could function at rates proportional to traffic flow and density in the viewing area."

This study has the strengths of a typical crash rate analysis. Although it cannot address questions of crash causation, the study can be used to determine that there were correlations between the operation of the advertising sign and the increase in crash rates in areas where the sign was visible.

Apparently five types of crashes were coded from the accident reports: rear-end, sideswipe, fixed object, other, and unknown. The report reviews only the data for the first two crash types, and this is appropriate. Both side-swipe and rear-end crashes are indicative of driver inattention or distraction, although this roadway section includes a complex interchange where merges and lane changes are likely. Poor signage and markings, difficult geometry, lane drops and other roadway characteristics could have been present (these roadway and traffic characteristics are not described) which might suggest elevated crash rates of these types.

When the goal is to determine whether a particular object or feature (in this case an electronic changeable message sign) caused crashes to occur, or caused the overall crash rate to increase, a study that is limited to an analysis of crash rates cannot answer this question. This is because the study is limited to post-hoc statistical tabulations. The study does not address, and clearly did not control for, the possibility that other changes took place in the roadway section studied in addition to the operation of the billboard. For example, changes to speed limits, police enforcement activities, reporting methods, use patterns, construction, development adjacent to the roadway, and many other factors, might have been present, and might have contributed to changes in crash rates. There was apparently no attempt made to identify whether any such factors may have occurred during the study period. In addition, the study apparently did not utilize a control section of roadway that might have overcome some of these potential weaknesses. Had the authors chosen a similar section of I-94 in the same general vicinity as the study section, but in which no advertising sign was introduced, they might have been able to compare before-and-after crash rates for the same period, but without the presence of the sign. This would have strengthened their ability to demonstrate that it was the presence of the sign, rather than some other factor, that related to the elevated crash rates.

The author states that the study areas included "all places where the variable message sign can be viewed by a motorist…." Since the precise billboard location is not identified on the site maps included with the report, it is not possible to determine whether all crashes occurred at locations where drivers would have had a clear view of the billboard prior to the crash.

Although the study evaluated crash rates before and after the introduction of an electronic variable message billboard with a message change interval of approximately every five seconds, no additional information is provided to enable the reviewer to determine the type of sign, the display technology, or the operational characteristics. As stated above, although crash rate data can supply valuable information relative to overall traffic safety in an area, it is not possible to identify a cause and effect relationship without far greater control of other, possibly relevant, variables – something that is quite difficult to do in a real world environment and with a post-hoc analysis of police accident reports.

Akagi, Seo, Motoda, 1996

These authors believe that, because of a combination of limited land, intense land use, and weak regulations, billboards are more prevalent along roadsides in Japan than they are in Europe and the U.S. They set out to study whether official road signs are more difficult to recognize when they are "hidden" among commercial signs and other roadside clutter such as buildings, utility poles, etc. To perform their analysis, they developed a visual noise ratio, defined as the ratio of the area of noise in a visual environment to a driver's field of view. They determined field of view from prevailing driving speed, e.g. 75° at 65 km/h, the speed limit on the road they studied. Their target sign was a typical national highway route marker, and they instructed their nine subjects (5 male, 4 female, and age range 21–66) merely to report as soon as they were able to confirm the route number. Eye movements were recorded from a point 400 meters upstream of each of six

signs that appeared along the route, within predefined sections. The visual noise ratio was measured at intervals of 20 m throughout each section. The authors found a statistically significant decrease in the detection distance of the sign as the visual noise level increased along the 400m approach to that sign. They further found that older drivers were significantly more adversely affected by the visual noise, and that males were more adversely affected than females. The authors conclude that visual noise along highways can be dangerous because it reduces the detection distance of important roadside information. While this study provides a unique approach to assessing the impact on driver performance of roadside distracters, and visual clutter, it suffers from several limitations. First, the number of subjects was quite small, and the distinction between older drivers and others is not defined. (There were only two subjects above the age of 60, for example). The definition of visual noise was somewhat vague, and the methodology used for measuring eye glances was unclear. Nonetheless, this is a novel, real-world approach to measuring the impact of roadside visual clutter, with a dependent measure (identifying the route number as early as possible) that is natural and reasonable.

Bergeron, J. 1996a

Bergeron undertook this study at the request of the Government of Quebec, which was considering whether to grant a permit for an electronic advertising sign adjacent to an expressway in Montreal. This project was not a research study; rather it reviewed the published literature in the field and applied the author's understanding of accepted theories and principles of psychology to address issues of driver visual perception and attention, and their role in traffic safety.

The majority of the studies reported on were those previously reviewed by Wachtel and Netherton (1980), and many of Bergeron's statements and conclusions parallel those of the earlier study. However, Bergeron (reporting 16 years after the Wachtel and Netherton study was published) also cites a small number of newer studies, and includes reviews of one study published in France that was not included in the earlier report. Further, Bergeron discusses some of the published literature in the field of driver performance in general, and with regard to official highway signs and other traffic control devices, and he applies the understanding gleaned from these studies to his interpretations about the role of advertising signs. The author reexamines the applicability to this issue of some of the key theories of attention and perception as previously discussed by Wachtel and Netherton, and expands upon this discussion. In addition, he cites the work of Wickens and others, and explains clearly the applicability of these theoretical constructs to issues of driver attention and distraction.

Although the report title suggests that the focus is on advertising signs in general, the principal interest is electronic signs, which Bergeron calls variable message signs, or VMS.

Bergeron's findings largely reflect those of other psychologists, cognitive scientists and traffic engineers who have addressed these issues. His primary conclusions are:

- Attentional resources needed for the driving task are diverted by the irrelevant information presented on advertising signs. This is an impact attributable to the "nature of the information" that is conveyed on such signs. This distraction leads to degradation in oculomotor performance that adversely affects reaction time and vehicle control capability.

- When the driving task imposes substantial attentional demands such as might occur on a heavily traveled, high speed urban freeway, billboards can create an attentional overload that can have an impact on micro- and macro-performance requirements of the driving task. In other words, the impact of the distraction varies according to the complexity of the driving task. The greater the driving task demands, the more obvious are the adverse effects of the distraction on driving performance.

- The difficulty of the driving task can vary in several ways. Those that relate to the physical environment (e.g. weather, roadway geometry, road conditions) are unavoidable, and drivers must adjust to them (unless they take an alternate route or wait for better conditions). Necessary sensory information adds to the workload of the driving task, but is, of course, needed to perform safely. In addition, road signs and signals that communicate complex but necessary information contribute to the overall workload of driving. In this case, however, years of study have been directed toward making this information as clear and as easily accessible as possible.

- To some extent, the level of mental workload that impacts driving occurs at a pre-processing level. Bergeron cites, as an example, a complex or cluttered visual environment. In this case, the attentional effort that drivers expend in searching for target objects (e.g. signs and signals) will be more laborious, demand more resources, and lead to declines in performance levels.

- The presence of a billboard increases the confusion of the visual (back)ground and may lead to conflict with road signs and signals.

- Situational factors that are likely to create a heavy mental workload include: complex geometry, heavy traffic, high speeds, areas of merging and diverging traffic, areas with road signs where drivers must make decisions, roadways in poor repair, areas of reduced visibility, and adverse weather conditions.

- The very characteristics of billboards that their designers employ to enable them to draw attention are those that have the greatest impact on what Bergeron calls attentional diversion.

- Drivers must constantly carry out the work of recognizing stimuli that may not be immediately meaningful to them. This task requires time and mental resources, both of which are in limited supply.

> - Attention directs perception, and vice versa. In other words, when we are looking for something, our sensory system places itself at the service of our attention. But it is also possible for a sensation to attract the attention of drivers because it may represent something that is of potential importance. For example, authorities put flashing lights on emergency vehicles because they want drivers to attend to them.

At some levels, this paper seems simply to restate many of the points already raised in other review articles on this topic. But Bergeron goes to greater lengths than several other authors to apply the theoretical underpinnings of attention, sensation, perception, and distraction, to the conclusions, however flawed, of many of the statistical, on-road, or laboratory studies undertaken over the past 50 years on the impacts on traffic safety of roadside advertising. These analyses are useful and appropriate, and provide a fuller picture of the concerns with traffic safety from the roadside use of DBBs than other studies. On the other hand, his writing suggests a clear bias against roadside advertising, and it appears that his dismissal of certain studies and his complementary reviews of others are affected by this bias. One minor concern is that he sometimes shifts his focus from billboards to official VMSs without affording the reader a clear understanding of this shift, thus leading to some confusion in interpretation. Bergeron provides no photographs or detailed descriptions of the types of DBBs that he studied. Thus, we do not know how similar the signs that he addresses are to those that are of principal interest in the present report. At one point, he describes VMSs as: "attractive, colourful, dynamic, sequential, and (able) to meet the needs of several merchants at the same time" (p.19). Clearly, these sign characteristics seem to fit those of digital billboards, but further comparisons are not possible. Despite these shortcomings, this thought paper is a useful contribution to our knowledge in this field.

Bergeron, 1996b

Whereas the Bergeron paper discussed above (1996a) is a thought paper that applies relevant psychological theories and concepts to the findings of research about the relationship of outdoor advertising to road safety, this paper reports on the author's analysis of two DBBs proposed for a specific location in Montreal, Quebec, Canada.

After a first-hand review of the site, the adjacent expressway, and architectural and engineering drawings for the proposed signs, Bergeron recommends that permits not be issued. He describes the site as possessing many of the characteristics that he, and others, have suggested would be inadvisable for the placement of billboard:

> ...complex geometry of the road environment, heavy traffic, high speed of traffic, merging and diverging traffic, areas with road signs and signals where vehicle operators are required to make decisions. Given these situational factors, we must avoid creating confusion in the visual field. In these conditions, road signs and signals must be clear and the nature of the information communicated must only serve to assist drivers in their task of driving. In like conditions, outdoor advertising signs can represent a threat to the safety of road users.

Bergeron suggests that billboards at this location can have adverse impacts on driving safety from several standpoints.

- At a perceptual level, they can make the response to official traffic control devices more difficult by adding to visual complexity.

- At an attentional level, they can lead to driver distraction; in a road situation such as that present at this site, the level of mental loading is already substantial, and the billboards would generate an unnecessary demand on a driver's limited attentional resources.

- The billboards could add to the drivers' mental workload, which, in turn, can lead to declines in selective, shared, and sustained attention, decision-making, and motor activities.

- Drivers who are unfamiliar with this location may have the added burden of time sensitive decisions that may be necessary to move into the appropriate lane for exiting or merging.

- Because this expressway section is elevated, the demands on the driver are further increased because there is little or no space to pull over in the event of mechanical or other failure, and because bridge structures are known to contribute to feelings of insecurity among drivers.

Schieber and Goodspeed IV, 1997

This study addressed the nighttime conspicuity (i.e. detection) of official highway signs under two different conditions of sign brightness. Although concerned only with official, not commercial, signage, there are valuable points made by these authors that are relevant to the discussion of DBBs. Using a specialized, in-house apparatus that was capable of reproducing most of the dynamic range of roadside environment visual stimulus luminance values, the authors compared "bright" and "ultrabright" signs under three different conditions of environmental (background) complexity: low (representative of a 2-lane rural highway); moderate (depicting a typical commercial street in a small city); and high (simulating a downtown street in an urban area with many businesses and illuminated commercial signs). The principal hypotheses were confirmed. That is, although enhanced sign brightness offered no advantage either for response time or accuracy in the low complexity background, it was significantly better than the lower brightness sign in both categories under moderate or high complexity environments. The results also confirmed that older drivers may be more susceptible to the interfering effects of higher levels of background complexity when they are looking for information on highway signs. The results suggest two concerns about DBBs. First, these signs tend to be located in complex visual environments, and public complaints have suggested they are often too bright. Second, in an effort to stand out from this complex background, i.e. make them more conspicuous; DBB operators often believe that, the brighter the sign, the

better. Our concern is that an excessively bright DBB in a visually complex, typically urban environment will succeed in drawing attention to itself and away from other signs in the environment, including official signs. Third, as this study, and others, have demonstrated, older drivers have a particularly difficult time detecting official highway signs in complex environments. Unfortunately, the trend in the U.S. is to increasingly more complex environments, which does not augur well for our aging society.

Theeuwes, et al., 1998, 1999

In a series of related laboratory studies, Theeuwes and his colleagues have demonstrated behaviors that may help to explain why the human eye may be drawn to a DBB at the expense of the driving task even when a driver has no intention, or desire to look at the billboard, and how this unintentional response can delay one's reaction time to time-critical on-road events. Their experiments also shed light on the finding that their participants were unaware that their eyes had been drawn to the distracter at the expense of the object that was their task.

In summarizing the relevant literature, the researchers describe findings that show that the human visual system is sensitive to events that exhibit sudden change; that a visual object presented with a transient luminance change captures attention automatically and reflexively. Even when observers have no intention to look for what Theeuwes call an onset, such an abrupt onset, when visible among other visual elements in the scene is processed first. Thus, it has been argued, sudden luminance changes (and this characterizes all DBBs at the point of message change) capture attention in what is known as a "stimulus-driven" manner, as opposed to being attentionally driven.

The studies reported here were conducted to determine whether such an abrupt-onset object that was irrelevant to the task being performed, would also capture the eye movement of the participant.

The experiment required participants to view a display containing six gray circles. After a set time, five of the circles changed to red (one remained gray), and all six simultaneously displayed a letter in their center. Participants were instructed that, as soon as the colors of the circles changed, they were to direct their gaze as quickly and accurately as they could toward the one circle whose color did not change, and push a button to identify the letter that appeared in that circle. (The five other circles displayed randomly chosen distracter letters which were never the same as the letter in the "target" circle). Eight participants performed 64 practice and 256 experimental trials. In half of the trials, a new red circle was added to the display at the same moment that the others changed and the letters were revealed. This new circle could appear at one of four possible locations within the display. This new circle was the "onset" or distracter.

The results showed that, when no new object was added to the display (the control condition), the participants were able to move their eyes directly to the target; however, in those trials where the new object was introduced (the experimental condition), participants' eyes often went toward the new object, stopped briefly, and then went on to

the target. In other words, with the new target present, two different eye movements were made, the first to the new, irrelevant target, and the second to the target that was the object of the task. Reaction time to the task (the identification of the letter inside the gray circle) was significantly slowed when the new, irrelevant target was present. The authors note that the task irrelevant stimulus attracted this initial eye glance even when it appeared in the direction opposite the target. At the end of the experiment, the researchers explicitly asked the participants whether they were aware that the new object affected their eye movements. The answers were that they were sure that their eye movements were not affected by the onset object. Their conclusion from this first experiment was: "Both the goal directed allocation of attention and the movement of the eyes to a clearly defined target can be disrupted by the appearance of a new but task-irrelevant object in the visual field, even when this object appears quite distant from the target" (Theeuwes, et al., 1998, p. 381).

In a second study using a similar paradigm, the researchers found that the attentional capture effects by the appearance of the task-irrelevant onset could be overcome when observers had sufficient time in advance to attend and program an eye movement to the location of a subsequent target stimulus. In other words, the distracting effect of the novel, task-irrelevant object can be offset when a person can, in advance of that distraction, focus on and attend to the principal target.

Cairney and Gunatillake, 2000

On behalf of the Royal Automobile Club of Victoria (RACV - the approximate equivalent of the AAA in the U.S.), Cairney and Gunatillake of ARRB Transport Research (formerly the Australian Road Research Board) undertook a review of the literature with the goal of generating recommendations for guidelines for the control of outdoor advertising in the Australian state of Victoria and its local jurisdictions.

The authors cited two prior, comprehensive reviews, one by Wachtel and Netherton (1980) in the U.S. and one in Australia on behalf of the ARRB by Andreassen (1984). Their search of three databases (INROADS in Australia, IRRD in Europe, and TRIS in the U.S.) uncovered no new studies in this field. What had changed since the two cited reviews, however, was the technology used for the display of roadside advertising, as well as the presence of more potential distracters within the vehicle itself. In addition, the authors report that some jurisdictions have made progress in the development of regulations "which are acceptable to advertisers while avoiding obvious distraction problems for drivers…" (p.2). They explain that, although these guidelines are not generally based on empirical evidence, they are based on solid human factors data and practical experience.

The authors identify, and briefly describe, six different types of signs, and suggest that different guidance or regulation is needed for each. Only two of the sign-types, the variable message and tri-vision signs, are relevant to our current study. They further discuss illuminated signs, and the types of motion or apparent motion that can be achieved by such signs, including: flashing, chasing, scintillating, etc., and they discuss

the appropriateness of restrictions on dazzling or glare impacts on motorists, and on maximum luminance (brightness) levels that should be appropriate for the ambient roadside environment. Finally, they suggest that the lighting color displayed on such signs should never mimic that of official traffic control devices, although they say nothing about the shape of images displayed. For all signs, Cairney and Gunatillake concluded that the common concern is the effect that a sign may have on a driver's visibility of other road users, the roadway, and traffic control devices, and that appropriate regulations generally prohibit signage in areas near where the demand for driver concentration is high, "such as intersections, interchanges, and level crossings" (p.3).

Although this report is not primarily concerned with recommendations of research methodology that might be used to study the effect of roadside advertising signs on traffic flow and safety, they mention three different types of investigative approaches that might be followed, and point out certain difficulties and disadvantages of each.

> The case-study approach involves the review and analysis of accident investigation reports. The lack of results from such studies does not, they believe, demonstrate that distraction from roadside advertising is not an issue, because drivers may be reluctant to admit that they were distracted or may not have been aware of being distracted. Further, distraction has not traditionally been an issue that accident investigators have drawn attention to, and thus it is likely that it is underreported.
>
> The site investigation approach involves the examination of crash rates; particularly crash rates of the types of crashes that might be expected to be related to distraction such as rear-end crashes, along different road sections distinguished by advertising sign presence or density. The authors point out that the major difficulty with this approach is that high advertising density tends to be correlated with other factors that might contribute to a high accident rate – i.e. a more demanding driving environment. Not stated is that such studies are typically unable to identify or control for variables that are outside the scope of the actual study, such as police enforcement, road construction, or weather conditions.
>
> The laboratory simulation approach enjoys the benefits of complete control over the experimental design, but presents the difficulty of generalizing from the simulated, artificial task in the laboratory to performance in the real world. In addition, although not discussed in this report, there is the difficulty of recreating the legibility, brightness and contrast of today's sophisticated advertising signs in simulation.
>
> Other research approaches, such as naturalistic studies, controlled-course studies, and unobtrusive observation, among others, are not mentioned.

The authors state that the majority of their review of the literature is based heavily on the Wachtel and Netherton (1980) study. Indeed, of the 14 studies reviewed by Cairney and

Gunatillake, all had been previously analyzed by Wachtel and Netherton. Accordingly, these re-reviews will not be discussed here. The conclusions of Cairney and Gunatillake, having re-reviewed these studies with the benefit of 20 years of hindsight, is that the conclusions reached by Wachtel and Netherton were appropriate, and still relevant to the development of guidelines in Australia in 2000. Among their specific conclusions are these:

> The best of the studies reviewed to date (Weiner, 1979) demonstrates that, when all confounding variables are controlled statistically, sites with advertising signs have higher crash rates than sites without. Indeed, the number of billboards did have a significant effect, and the number of crashes increased in proportion to the number of billboards. The effect size, however, is modest.
>
> Because the effect size is small, this suggests that large, well-controlled studies will be required to detect significant effects. "There is a risk that small studies will not produce sufficient effects and be misinterpreted as showing that there is no significant effect when the proper conclusion is that there is insufficient data to reach a conclusion" (p.9).
>
> Changeable message signs may have a more direct bearing on crash rate than static signs.
>
> The outcome of the laboratory studies complements those of the (on-road) correlational studies. Although drivers are resistant to distraction, simulated advertising has a small but consistent, and adverse, effect on performance, particularly where task demands are high, and on peripheral tasks. Further, advertising material that is similar in appearance to traffic control devices, or that is proximal to such TCDs in the driver's visual field, may be particularly troubling.

In summary Cairney and Gunatillake believe that the cited findings suggest that unregulated roadside advertising has the capacity to create a significant safety problem. Interestingly, they state that their results "run directly counter to Andreassen's (1984) conclusion that 'There is no current evidence to say that advertising signs, in general, are causing accidents'" (p.9).

The remainder of this study addresses the existence of guidelines and regulations, and puts forward recommendations for future controls. This will be addressed in Section 5 of the present report.

Farbry, et al., 2001

This report, by the Federal Highway Administration's (FHWA's) Human Centered Systems Team, reviewed the literature related to the safety implications of electronic billboards (EBBs), presented findings, and recommended a research plan to address knowledge gaps. It was a follow-up to an earlier FHWA report (Wachtel and

Netherton, 1980), and it complemented contemporaneous driver distraction studies that addressed in-vehicle displays. The project included tri-vision signs within the broader category of EBBs.

The literature review included: an assessment of state billboard regulations and policies relevant to EBBs and tri-vision signs; billboard-related crash analyses and potential safety factors such as distraction, conspicuity, and legibility; and driver and roadway characteristics. Because there was a limited amount of available research on external (to the vehicle) distraction, the review included an assessment of studies of in-vehicle distracters as a surrogate to understand how potential distraction may affect the driver.

The knowledge gaps were categorized into three areas: roadway geometry, sign characteristics, and driver characteristics. Each of these areas was reviewed and preliminary research plans were proposed, including goals and research questions. The roadway characteristics identified for future research included horizontal and vertical curves, intersections, work zones, and EBB and tri-vision sign spacing. Sign characteristics for needed study included content and comprehensibility, exposure time, motion, and sign maintenance. Driver characteristics related to age and route familiarity.

The authors describe the capabilities of EBBs, both complex and simple, and state that the simpler technologies used in some EBBs are similar to those employed in changeable message signs (CMS) used by roadway authorities in both permanent and portable installations to communicate official traffic information to motorists. The report notes that such signs may also be called variable message signs (VMS) or dynamic message signs (DMS). Tri-vision signs are described as more limited in capability, but of interest because of: (a) the rotation (movement) of their cylinders to present three different messages, (b) the presentation of two partial messages simultaneously (during the change interval), and (c) potential variations in light reflected back to the driver as the panels rotate.

A review of State practices concerning regulation of EBBs demonstrates that, unlike with static (fixed) billboards, there is little consistency from one jurisdiction to the next.

The literature review, while updating that in FHWA's 1980 study, differed from the earlier study in three ways. First, the newer study did not review the literature critically as did the previous study; and second, the newer study reviewed a subset of the literature whereas the earlier study attempted a comprehensive review of the extant literature. On the other hand, the newer study synthesized the prior research in a manner that the analytical and chronological approach of the earlier study did not. The 2001 study grouped the reviewed work into common topics areas, permitting the reader to more easily grasp the multifaceted nature of DBB issues, and to better appreciate the existing knowledge gaps with regard to the safety implications of these devices.

The authors identified relevant research in other aspects of road safety that might not, at first, seem to relate to the possible safety implications of roadside electronic billboards. Areas of research interest such as older and younger drivers, distraction due to in-vehicle

technology, and display and lighting characteristics of changeable message signs used for official purposes, are all discussed. Clearly, these areas of research *are* relevant to DBBs, as will be discussed below.

Specific attention is given to other technologies (such as in-vehicle distracters) as they may be relevant to the potential threat of distraction from electronic billboards. For example, the study summarizes work by Wierwille and Tijerina (1998) that calculated the total number and average duration of eye glances required to operate specific in-vehicle devices (such as climate controls, HVAC, mirrors, and others). "Exposure" was defined as the number of glances multiplied by the time per glance, and the researchers found that there was a linear relationship between exposure and number of crashes. The FHWA authors suggest that a similar approach might be undertaken to assess the maximum amount of time that a driver could attend to a distraction source outside the vehicle. Similarly, the authors review several studies that examined the relationship between cellular telephone use and crashes, and they divide such phone-related distraction into three categories: manual manipulation of the phone; glancing at the phone (which requires looking away from the roadway), and engaging in conversation (which may disrupt concentration on the driving task). They conclude that the latter two contributors to distraction due to the use of cell phones may have parallels with distraction from roadside electronic billboards.

They also identify research methodologies used in other applications that may be applicable to studying the impacts of EBBs. For example Olsson and Burns (2000) developed a "peripheral detection task" designed to measure visual distraction and mental workload; with appropriate modifications this approach might be useful for the study of distraction and workload effects of roadside electronic billboards, along with classical driver performance measures of lane deviation and speed maintenance.

A number of the conclusions reached, while highly relevant, might be seen even more strongly in light of the observations made by other researchers. For example, the authors appropriately suggest that there may be lessons from studies into the legibility and conspicuity of official changeable message signs that could be applied to DBBs. They further discuss the fact that low levels of illumination on official signs could lead to reduced conspicuity and, hence, reduced legibility. This difficulty might be exacerbated because DBBs typically have very high luminance levels, often leading to complaints by the traveling public as well as regulators. These high luminance levels may increase the conspicuity of the DBBs at the expense of official signs. Similarly, the authors discuss differences in response to signs by familiar vs. unfamiliar drivers, since it is understood that motorists who pass the same signs regularly become acclimated to their presence and may ignore them. Of course, one of the defining characteristics of DBBs is their ability to display a new message every few seconds, thus, in effect, presenting displays that are always new and therefore unfamiliar to all drivers.

One of the principal purposes of this project was to identify needed research and propose approaches to conduct such studies. The authors describe the goal of such research as determining whether there are conditions under which EBBs are a safety concern as

demonstrated by crashes or other types of degraded driver performance. They identify *research findings*, information that is available in an area that may be relevant to studies of EBB safety, and *research questions,* goals of research still needed. They appropriately note that, because findings from some otherwise relevant prior research studies did not directly address EBBs, it may still be necessary to replicate some of the earlier work with these newer billboards. The authors identify relevant characteristics of the roadway environment, sign design and operation, and driver-related issues, and identify the research needs in each area. This section of the report ends with a brief overview of four research methods that the authors suggest might be appropriate for future research. These include: documentation analysis (accident analyses of EBB locations with controls); field studies (data collection by observers in the field); test track studies; and simulation. Because this was intended only as an overview of the four methods, they are not described in sufficient detail for the reader to understand the advantages and limitations of each method for studies of this complex real-world issue.

Beijer, 2002

Beijer undertook a comprehensive, on-road investigation with 25 participants who had their eye movements recorded while driving along a heavily traveled expressway in Toronto, Ontario, Canada. Advertising signs visible to drivers were evaluated for the number and duration of eye glances made to each. The signs varied in size, distance from road, and side of road. Signs using four different display technologies were included: conventional billboard, scroller, roller-bar, and video. There were apparently no signs studied featuring the technology of most interest to the present report, DBBs or CEVMS. Because much has been written about the likelihood of different driver response to outdoor advertisements based on temporal driving demands, Beijer operationally defined demand in a simple, effective, and naturalistic, although somewhat limited, manner. Specifically, he identified the distance between a participant's car and the vehicle immediately ahead of it in its lane. If that distance covered one skip line and space, he considered the task demand on the participant to be high; two skip lines and spaces was called medium; three skip lines and spaces was deemed low; and anything beyond three skip lines and spaces was defined as no demand. Although Beijer recorded this data for all three lanes of traffic moving in the same direction as the participant, he analyzed only the same-lane data. As stated above, while this operational definition is somewhat crude and doesn't account, for example, for the demands imposed by traffic immediately behind and/or adjacent to the participant's car, or for demands created by changing traffic speeds or roadway geometry, it has the advantage of being easily measured and naturalistic.

As background for his study, the author reviewed earlier eye-movement research that addressed visual demand on drivers. He cites work by Rockwell (1988) and Wikman et al. (1998) each of whom suggested that, when drivers have spare visual capacity, one second was about the maximum for safe non-driving related glances. Separately, he cites work by Zwahlen (1988) and the same paper by Rockwell that suggest that two seconds is a practical maximum, because glances longer than this are associated with lane-keeping errors. Since the presence of other vehicles in the traffic stream increases

demand, Beijer suggests that, in heavy traffic, "glances at (advertising) signs may be inappropriate (p.3), and the measurement of such glances was one of the key objectives of this project.

One concern with Beijer's adoption of the "two-second rule" (p. 14) is his reliance on the Rockwell study that suggested that drivers' visual glances are affected by four factors, one of which is the sampling of in-car electronic devices. Beijer's assumption that glances at roadside advertising is similar, and therefore should produce quite comparable results to, the in-car displays studied by Rockwell, is overly simplistic, given that the eye and head movements required may be quite different, that in-vehicle displays can be viewed at any time, whereas a compelling roadside advertising sign can be viewed only while the sign is being approached, and given the understanding, as expressed by Chan et al. (2008) that drivers looking down at in-vehicle displays know that they cannot see the road ahead and thus may be motivated to return their gaze to the forward roadway view as quickly as possible, whereas drivers looking at roadside advertising signs, particularly signs close to their line of sight, are likely to still have the forward roadway view in their peripheral vision, and thus may feel less need to return their gaze quickly to the foveal view.

Again citing Rockwell (1988) Beijer distinguishes between two measures of eye gaze. The mean number of glances (MNG) is sensitive to demand, and increases with the complexity of the task, whereas the average glance duration (AGD), in Rockwell's work, was relatively insensitive to changes in demand. Rockwell reported that, as traffic conditions become more demanding, drivers increase the MNG while shortening the AGD, although the total off-road viewing time remains nearly the same. This suggests that drivers are able to modulate their glances as task demands build, so as to better "time-share" these off-road glances with attention to the forward visual field as necessary. Conversely, one might expect that drivers who engage in long AGD behavior even when confronted with high task demands are less willing or able to devote the appropriate visual resources to the driving task.

Beijer tested two basic hypotheses:

> 1. The most distracting signs will be those that are larger, active rather than passive, closer to central vision, and on the right side of the roadway.
>
> 2. Signs located in an area with a low density of other signs, and with less demanding traffic, would receive more attention. (He states: "Signs that receive attention despite a heavy traffic density or a demanding route are referred to as receiving 'inappropriate attention' [p. 28]).

The 25 participants in this study drove a 6 km section of the Gardiner Expressway, and passed a total of 61 commercial signs. These included 24 small and 18 large billboards (sizes were not specified), 5 video, 12 scrolling text, and 2 roller bar signs. The signs were equally divided (30 left and 31 right) on both sides of the highway.

Based upon the related work of Smiley and her colleagues (Smiley, Smahel & Eizenman, 2004; Beijer, Smiley & Eizenman, 2004) Beijer defined "long glances" as any glances of duration greater than 0.75 second. Overall, he found that 22 (88%) of his participants made long glances at one or more signs; and five (20%) made glances of longer than two seconds to one or more of the advertising signs. The longest recorded glance was 2.07 seconds. As expected, the "active" signs commanded more, and longer glances per sign than did the "passive" signs (large and small conventional billboards). Scrolling text signs amounted to 20% of the total, but commanded 42% of all glances, and 40% of all long glances. Roller-bar signs represented only 3% of the total, but captured 6% of all glances and 6% of long glances. Video signs represented 8% of the total, and captured 19% of all glances, and 31% of long glances. Small and large (static) billboards combined represented 69% of the total, but captured only 32% of all glances and 23% of long glances. In essence, these findings demonstrate that static signs captured a percentage of glances and of long glances amounting to about half of their representation on the road, whereas all three types of active signs attracted a percentage of glances and of long glances approximately equal to at least twice their representation on the road.

In terms of statistical significance, the roller-bar and video signs received significantly more long glances per sign than did the billboard or scrolling text signs. Beijer expresses some surprise that the roller-bar signs would capture as many glances (and long glances) as the video signs because, "unless a subject actually catches the Roller Bar sign during a change, it could very well be mistaken for a Billboard" (p. 71). He suggests, however, that "anecdotal evidence points to some people (saying) they anticipate and watch (the Roller-Bar sign) for the change to a new message/advertisement" (p. 71).

When task demands increased, the author found that the number of glances made per sign decreased significantly; average and maximum glance durations appeared to decrease, but not significantly.

Beijer finds that his results differ from earlier studies, particularly those of Andreassen (1984) and Hughes and Cole (1986), and attributes this to the differences in sign technology. He states: "Certain signs are much more distracting than those studied in previous experiments" (p. 68).

One of Beijer's main hypotheses – that signs on the right side of the road would receive more glances than those on the left – was not confirmed. In fact, the two signs (of 61 in the study) that were the most frequently viewed were both on the left side of the road. The author believes that this may have been attributable to sign placement – both of these signs were positioned close to the drivers' line of sight. Conversely, the signs on the right side of the road, particularly the active signs, were not typically placed as close to the road as those on the left, and were farther from the drivers' central line of sight. This finding of more views for signs on the left is not only counter to what the author expected at the start of the study, it is contrary to data found in previous studies (e.g. Mourant and Rockwell, 1970), that found that drivers tend to concentrate their glances on the right portion of the road. Beijer suggests that this somewhat surprising finding may be because modern day drivers are more used to looking at official signs that are mounted overhead

above the travel lanes vs. older signs that were typically mounted on the right. Of course, it is also possible that the signs on the left were simply more distracting, and more capable of attracting the drivers' attention than those on the right.

A finding of safety concern is that, although higher levels of task demand were associated with a reduction in the *number* of glances made to the signs, the average and maximum *duration* of these glances was not reduced as task demands increased. As the author states: "This would seem to indicate that drivers are comfortable turning their attention away from the road for a set period of time, regardless of the demands of the driving task (i.e. traffic conditions)" (p. 76).

Of the 926 total glances made by the 25 participants in this study, 198 of them (21.4%) were 0.75 seconds or longer, and 10 were longer than two seconds. Since these very long glances were made by five different participants, and the long glances were made by 22 out of 25 of the participants, the author concludes: "... distraction (from advertising signs) is not just an isolated incidence by one or two participants" (p. 77).

When only long glances were considered, the differences between sign types became highly significant. The video signs received more than five times as many long glances as the large static billboards. In fact, one of the five video signs received the majority of the long glances. This sign was positioned close to the drivers' field of view, where it could be seen for a considerable distance, and where there was very little visual clutter, enabling the sign to dominate the visual space. The author concludes that sign placement within an approaching driver's field of view may be more important than the sign's lateral distance from the road edge. Signs in the center of the field of view tend to receive more glances, regardless of distance, than those farther in the periphery. Beijer notes that current policies regarding the distance of commercial signage from the road does not distinguish between straight sections and curves and does not account for the sign's location within the line of sight. He suggests using line of sight, or angle from the center of the lane.

Young and Regan, 2003

Although this paper is concerned only with in-vehicle distraction, it is addressed briefly here because of its clear explanation of driver distraction and inattention, and its potential consequences. The authors cite Stutts et al. (2001) who define distraction as occurring "when a driver is delayed in the recognition of information needed to safely accomplish the driving task because some event, activity, object or person within or outside the vehicle compelled or tended to induce the driver's shifting attention away from the driving task." It is the required presence of this triggering event or activity that distinguishes distraction from the broader category of driver inattention. There are generally four types of driver distraction that are considered: visual, auditory, biomechanical, and cognitive. When considering the potential distraction due to roadside billboards, we are talking about visual distraction. The authors summarize their short paper by recognizing that converging evidence suggests that driver distraction contributes to crashes, and that the prevalence of distraction as a risk factor is likely to increase as

new technologies are brought to market. Although they are addressing in-vehicle distractions, their statements can apply to external distraction, including DBBs, as well.

Wallace, B., 2003a, b

Wallace describes this paper as a literature review and meta-analysis, based on research that he carried out for the Scottish Executive's Central Research Unit. The goal of this study was to answer the question: Is there a serious risk to safe driving caused by features in the external environment (focusing on billboards) and, if so, what can be done about it?

The author states that this subject has been under-researched, but that there is evidence that, in certain cases, "over complex visual fields can distract drivers" and that it is unlikely that current guidelines or regulations are adequate to deal with this concern.

Wallace cites a number of the early U.S. accident analyses, most performed in the 1950s and 1960s, which generally showed that higher road complexity, especially that related to intersections, curves, and roadside development, was associated (correlated) with higher accident rates. He interprets and groups the conclusions of several of these studies to suggest that the presence of billboards adjacent to such roads, especially when the billboards were located at or near curves or intersections, contributed to these higher accident rates.

After reviewing seven on-road and statistical studies and two laboratory studies, the author concludes that, despite certain weaknesses in each study, they "start to tell a story," which is, as Wallace puts it, that when drivers are looking for something (i.e. a traffic sign or signal) their reaction times will be slowed by the presence of distracting advertisements." This conclusion is supported by the more recent work of Crundall and his colleagues (2006), discussed later in the present report.

After summarizing his conclusions from these studies and experiments, Wallace turns to theories that might help explain these findings. His interpretation is that theories of attention and perception suggest that drivers may be susceptible to distraction from their driving task at any time, but that this is most likely to occur when such drivers are searching for something, and especially when they do not know what they are searching for and when there is a great deal of clutter in their visual field. He interprets the Holahan (1978) and Johnston and Cole (1976) laboratory studies as demonstrating this effect, and the field studies as further supporting these predictions by finding higher correlations between billboards and accidents at intersections. Further, he cites the Ady (1967) study for actually demonstrating that an advertising sign with bright lights, positioned at a curve in the road, was shown to have caused accidents. He believes that this finding supports Berlyne's theories of the orientation reaction, where the human brain functions in a manner to modulate arousal levels. In the case of the one billboard (out of three) found by Ady to have caused accidents, Wallace describes the situation as being a stretch of road where drivers were operating in conditions of low arousal, where they might have succumbed to "highway hypnosis." The sign, according to Wallace's interpretation,

might have caused these drivers to experience phototaxis (also called the "fascination phenomenon") in which the large, bright billboard captured their attention to such an extent after a long, monotonous stretch of road, that drivers became "absorbed" in the sign, and simply failed to notice or respond to the curve in the road where the sign was located.

Wallace's review of early accident studies is open to challenge for several reasons. He finds fault with the fact that these studies demonstrated only correlations between advertising and accidents, rather than proving a cause-and-effect relationship. While it is true that correlation cannot prove causation, it is wrong to think of this as a weakness in the research. The flaw, if any, is in the misinterpretation or misuse of this data. Further, Wallace seems to attribute certain methodological weaknesses in some of these studies (e.g. not controlling for traffic flow or roadside development) to the fact that these studies were correlational by design. In truth, because a study undertakes a correlational rather than causation analysis is independent of whether its methodology is flawed. The types of statistical oversights that Wallace attributes to these studies are real, but they are not a result of the researchers' choice to undertake correlational analyses only.

It is of further concern that Wallace's review of these earlier studies, and his critique of previous reviews of them, seems intent on demonstrating his main point, which is that outdoor advertising signs at intersections are a problem that warrants attention. If a study, or a critique of a study, did not support this argument, then Wallace tends to be dismissive of it. This is not to say that his point is wrong; it is simply to suggest that his reviews seem colored by an effort to reinforce his conclusion, and his critiques are selective as a result.

Wallace dismisses correlational studies, apparently because he believes that only studies that can prove causation have merit. By extension, he dismisses on-road studies because it is difficult, if not impossible, to undertake such a study with the degree of experimental control that might support findings of causation. In this same vein, he praises "experiments" (i.e. controlled laboratory studies) for their ability to demonstrate causation. He does, however, recognize that, with their abstraction from reality, it may be difficult to generalize findings from such experiments to the real world. As Wallace states it, such experiments lack ecological validity, i.e. the degree to which they reflect real world driver behavior.

Despite these criticisms, Wallace does a reasonable job of bringing together the predictions that come from theory, and the findings of laboratory studies and accident analyses to support his major thesis; that roadside billboards can be a major threat to road safety under certain, situationally specific, conditions.

In summary, his major conclusions are:

a. The adverse effect of billboards is real, but situation specific.

b. Too much visual clutter at or near intersections can interfere with drivers' visual search and lead to accidents.

c. It is "probable" that isolated, illuminated billboards in an otherwise boring section of highway can create distraction through phototaxis.

The principal points made by Wallace, both in his summaries of past research and in his interpretation of psychological theories of attention and distraction, are that outdoor advertising signs are likely to create dangerous levels of distraction for drivers when they are placed at complex or challenging road locations such as intersections or curves, or when they exist in the midst of otherwise understimulating sections of roadway.

While there has been little research into the possible role of phototaxis on driver performance, there is broad agreement by researchers that billboards, in general, can create inappropriate levels of distraction when placed in areas of high driver task demands. Wallace identifies two such areas – intersections and curves. Other conditions and circumstances, such as merges, lane drops, and decision points, have been cited by others.

Although this study was silent on billboard technologies, the text suggests that Wallace was principally concerned with traditional fixed billboards (with the exception of his citations of prior research). And, while digital billboards are not explicitly discussed, it is reasonable to assume that the situation specific conditions addressed in this study would apply equally, if not more strongly, to these newer technologies.

CTC & Associates, 2003

Prepared at the request of the Wisconsin Department of Transportation (WisDOT), Transportation Synthesis Reports (TSRs) serve as brief summaries of currently available information on topics of interest to the WisDOT technical staff. The reports are compiled from sources such as NCHRP, TRB, AASHTO, other state DOTs, and related academic and industry research. The impetus for this particular report was a concern raised about the predicted safety impacts of outdoor electronic advertising signs, called electronic billboards (EBBs) in this report, as well as tri-vision signs.

The report summarizes a highly selective set of studies in several areas. These are identified as: Overview, State and Local Studies, Driver Distraction, and Avenues for Research. In addition, a brief summary is provided of pertinent Wisconsin regulations that address two types of electronic outdoor advertising, "multiple message signs" (tri-vision) and "variable message signs" (electronic billboards or EBBs).

In the Overview section, the report references the Federal Highway Administration's (FHWA) Office of Real Estate Services (ORES) website for a detailed history of the federal outdoor advertising control program, and the ORES 1996 and 1998 policy statements on changeable message signs.

Summaries are also provided of the FHWA 2001 report titled "Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction" (Farbry et al., 2001). Among the key findings of this report were that: (a) determining the effect of roadside billboards on safety is difficult due to both theoretical and methodological reasons; (b) there does not seem to be an effective method appropriate for evaluating the safety effects of EBBs on driver attention or distraction; (c) the legibility requirements used for official changeable message signs may be relevant to the design of EBBs; (d) there is potential in the use of methods to assess distraction from in-vehicle information systems for EBBs; (e) although the 42 states surveyed have generally consistent regulations for traditional (static) billboards, there are no common guidelines governing EBBs and tri-vision signs across states; and (f) few states even define the term "electronic billboard."

Based on the FHWA survey of states, the report identifies issues that may pertain to EBBs. These include: red, flashing, intermittent or moving lights; glare; use of traffic control device symbols or words; illumination or sign placement that might interfere with a traffic control device; spacing and timing.

The report summarizes a study performed for the South African National Roads Agency Limited (SANRAL) (Coetzee, Undated) that looked at the content of outdoor advertising "based on driver characteristics," and it discusses a number of the articles previously reviewed in the FHWA report of 1980. In addition, the report discusses a 1999 survey conducted by the National Alliance of Highway Beautification Agencies (NAHBA), which reviewed state regulations regarding tri-vision signs, and which included a discussion of the Minimum Exposure Dwell Time and the Maximum Transition Twirl Time boundaries contained within the policies of several of these states.

In the section on Driver Distraction, the authors quote from the 2001 FHWA study and the website of the Outdoor Advertising Association of America (OAAA), both of which describe the intention of outdoor advertising to catch the eye and draw attention. The quotations from OAAA go further, and describe newer technologies that permit such signs to "talk to you," and include other interactive features.

The report then reviews several studies of driver distraction, some of which employed accident analyses from Federal databases and others which employed actual on-road research using a variety of methods to measure distraction. The American Association of Automotive Medicine (AAAM, 2001) analyzed crash data from the national Crashworthiness Data System (CDS) from 1995-99, and determined that 12.9 percent of drivers were distracted at the time of their crash, and that 29.4 percent of those drivers cited "persons, objects or events outside the vehicle" as the source. Other studies are cited, with differing results reported.

Other studies were reviewed that analyzed driver eye and head movements, and showed that greater visual complexity associated with a high volume intersection required drivers to search the environment more than at lower volume intersections. The authors, citing the 2001 FHWA study, state: "it can be conjectured that additional visual stimuli such as

billboards, may add additional demand to driver workload in high-volume intersections" (p.6)."

Although still in the section on Driver Distraction, the authors next discuss several studies that dealt with information processing demands for reading dynamic message signs with unfamiliar messages. Human factors research carried out by FHWA is cited that found that the 85th percentile driver on a low-volume highway could read signs with word messages at the rate of one major word per second. Interpretations are made (it is unclear whether these belong to CTC or to the original study authors) to suggest how many words or symbols could be read by drivers approaching signs under different conditions (e.g. day vs. night; 100 vs. 80 km/h speed; perfect vs. degraded vision; 14 vs. 6 inch letter height). The authors list other factors, including driver workload, message familiarity, and message format, that can affect the time needed to read a sign message, and conclude this discussion by citing another study, which states: "it is important that the message must be legible at a distance that allows sufficient exposure time for drivers to attend to the complex driving situation and glance at the sign a sufficient number of times to read and comprehend the message" (p.6).

Brief mention is made of a number of states that have attempted to identify a relationship between EBBs and safety using traffic conditions "as a surrogate measure" (although it is not clear what this means in the context of this report). States variously reported no evidence of increased traffic problems, or an inability to identify a relationship between crashes and EBBs. However, no information is provided as to how this information was obtained, or whether any actual research or analysis was conducted to address these questions. Again, it is not clear whether these statements are those of the authors of this report or the cited study.

Finally, in a section titled "Avenues for Research," the authors return to the 2001 FHWA study, which suggests several needed studies. A study conducted in 2000, using a methodology called a peripheral detection task to measure visual distraction and mental workload is cited as a promising approach. The authors suggest that this approach might be useful in addressing distraction due to in-vehicle systems and, if so, "it may also be applicable to stimuli external to the vehicle such as EBB and tri-vision signs" (p.7). The authors note that research is needed about the effects of EBBs in highway work zones. Since work zones are known to be high accident locations due to many factors, it is reasonable to assume that these are very high driving demand environments where safety challenges could be exacerbated by additional sources of visual distraction. But the report merges a discussion of work zone demands with those of other complex highway environments including horizontal and vertical curves, and interchanges and intersections. Thus, the focus of the suggested research is unclear. "Changeable message signs" (CMSs) are discussed next, and although not stated, it seems clear from the context that these are official highway signs rather than billboards. A number of research studies are cited that address the legibility requirements of such signs, including issues such as character font, number of characters per line of text, number of lines, luminous contrast, positive contrast orientation, etc.

Because this paper does not represent original research, there is no criticism of the methods used or the assumptions made. It is unfortunate that the authors seem to use multiple terms when referring to the same technology – terms including electronic billboards (EBBs), variable message signs (VMS), dynamic message signs (DMS), and CMS (which, although not defined, presumably refers to changeable message signs). Another source of some confusion for the reader is that it is often not possible to know whether statements made in the report are those of the authors of the studies under review, or those of the reviewers who prepared this report.

Lansdown, 2004

Following a similar thread to the earlier work by Cole and Hughes (1984), Lansdown suggests that the significance of information presented by roadway signage should be explicitly linked to a hierarchy of priorities. Safety information should have the highest priority for signage, followed closely by regulatory information and then travel efficiency. Sign design should meet the conspicuity needs of the driver, as, by example, safety and warning signs possessing high attentional conspicuity (i.e. they are conspicuous to all drivers whether or not they are expected, and whether or not the driver is looking for them), whereas signs conveying navigational information need only meet the lower standard of search conspicuity, in that they contain information that is only relevant to the subset of drivers that is looking for it. Lansdown suggests that irrelevant information such as advertising signs should be treated as low-priority information and "constrained in its attention-demanding capacity" (p. 76).

Finnish Road Administration, 2004

This two-part study was conducted on behalf of the Finnish Road Administration (VTT) to provide background material for policies about roadside advertisements. The goal of the project was to conduct a general assessment of prior studies on the effects of roadside advertisements on safety, and to determine whether advertisements are the cause of fatal accidents.

The first part of the study was performed by Docent Juha Luoma of VTT Building and Transport, and consisted of a critical summary of existing research, an assessment of the need for policies, and a discussion of the problems related to studying the safety effects of roadside advertisements. The second part of the project was an extract of a previous project performed for VTT by the Helsinki University of Technology. This earlier work reviewed the accident investigation committee reports of fatal accidents that occurred in 2000-01, the objective of which was to determine if there was evidence that advertisements were partial causes of the investigated accidents.

The effects of roadside advertisements (billboards) have been previously studied in Finland in the 1970s by Lehtimaki and in the 1980s by Luoma. In a 1984 article, Luoma summarized the findings as follows:

- In general, the number of accidents near roadside advertisements has not been observed to be higher than at reference sites (those without advertisements).

- The negative effects of advertisements are visible in accident statistics if they are focused on intersections.

- The effects of advertisements are apparent in driver behavior, but the effects measured under normal traffic conditions are small.

- Advertisements distract the detection of traffic signs and possibly also other objects relevant to the driver's task.

The last conclusion above was based on similar results obtained from both real world observation (under normal traffic conditions) and a simulation study (under high workload conditions). The authors surmise that "small effects visible in a normal situation may in exceptional situations become significant from the standpoint of safety (p.11), but Luoma predicted that the similar outcomes from these two studies would not be accepted as sufficiently conclusive that it would lead to clear-cut measures of control.

In a later study, Luoma (1988) studied drivers' eye movements and responses to a survey in the vicinity of different kinds of observed objects. The results indicated that "drivers looked at roadside advertisements for a long time compared to traffic signs" (p.10). These results suggested that the information presented in the advertisements could not be perceived quickly or easily.

The authors reviewed a small number of other studies, and summarized them as follows:

- The Federal Highway Administration study of 2001 (FHWA, 2001) "did not include clear conclusions on the effects of roadside advertisements on road safety" (p. 11).

- A study by Boersema et al. (1989) found that, at a railway station, "object recognition slowed as the number of advertisements increased" (p. 11).

- A study by Lee et al. (2003) concluded that roadside advertisements do not change driver behavior. "However, their conclusion is contradictory to the results, since there were differences between the results near the advertisements and the reference sites." In addition, "the test setup apparently was unsuitable and insensitive… and the analysis of eye movements compared average focusing of vision to the right, centre and left, which hardly indicates the effects of advertisements situated on different sides of the road" (p.11).

From their review of earlier work in this field the authors suggest research strategies that might be most successful in the future. They believe that accident studies, driver interviews and questionnaires are not sufficiently sensitive to measure the possible effects

of billboards on road safety. They also dismiss laboratory tests and simulator studies because they doubt that such studies will produce stronger evidence than those that have been previously undertaken. Another approach, involving experimental field research with test drivers is not recommended, in part because data collection is time-consuming and expensive. Instead, these authors believe that the most promising research methodology for studying the potential impact of roadside advertising on traffic safety is by measuring the behavior of normal traffic without interfering with the traffic in any way. (This is what we would call unobtrusive observation). They believe that the most difficult challenge will be to find appropriate measures of driver behavior.

The second phase of this project analyzed fatal accidents at intersections. We will address this only briefly. Apparently, the research team reviewed the reports of the "accident investigation committee" of fatal accidents that occurred in 2000 and 2001. (It is not known whether this committee reviewed only fatal accidents or whether the researchers chose to examine only that subset of the committee's work that reviewed only fatals). Of 405 fatal accidents identified by the committee and reviewed by this research team, six were identified in which it was concluded that advertisements were a partial cause. In those six accidents, there were nine fatalities and two injuries. In four of the six cases, it was found that the advertisement obstructed the visibility of traffic on the cross road; in one case it was concluded that an advertisement distracted the driver's attention away from the road; and in the final case it was found that both factors were present. We are unable to evaluate the efficacy of this part of the study, since we do not know how the studied accidents were selected, how the reviews were conducted, or how the conclusions were reached.

Smiley, Smahel, and Eizenman, 2004

This study was performed on downtown streets and an urban expressway in Toronto, Ontario, Canada. The researchers studied 16 drivers, all drawn from the age group (25-50 years) with the lowest accident rate. Eye movements were recorded as the participants approached and passed four sites with video advertising signs (three on local streets and one on the expressway) and, with the exception of the expressway location, the same sites in the opposite direction, where the video signs were not visible.

The authors found that 76% of all glances captured were made looking ahead at traffic, whereas drivers glanced at the video signs on 45% of the occasions when such signs were present. Glances at outdoor advertising signs, including the video signs, amounted to only 1.2% of total glances. The mean glance durations were generally between 1/5 and 3/5 seconds. The distributions of glances and glance durations were similar for the video sign and non-sign approaches. Approximately one-fourth of the glances at video signs were greater in duration than 0.75 seconds, a value which the authors consider to be of concern because this represents the minimum required perception-reaction time (PRT) to a slowing vehicle ahead. Although some glances at video signs were made with short headways to the vehicle ahead (one second or less), at large angles (up to 31°) off the line of sight, and for long durations (as long as 1.47 seconds) there was no evidence that these glances compromised the drivers' recognition of potential conflicts with pedestrians or

bicyclists, and no evidence that the glances at the video signs reduced the proportion of glances at traffic signs or signals.

The authors caution that only a small number of subjects participated in the study, that these subjects were drawn from the safest age range of drivers, and that the subjects knew they were being observed and their glances recorded. In addition, the four video signs differed from each other in characteristics such as size, height above grade, proximity to the road edge, sight and legibility distance, and the complexity (or clutter) of the visual environment in which they were located. Although the signs' sizes are not presented, the figures in the report suggest that the video signs were quite small in comparison to others that are in growing use. Finally, the authors refer to an earlier study that found that a video sign in the drivers' line of sight and visible for an extended period was "very distracting" (p.83). That study (Beijer, 2002) is discussed above.

Beijer, Smiley, & Eizenman, M., 2004

This study evaluated eye glances toward four different types of roadside advertising signs through the use of eye movement recordings as subjects drove along an urban expressway in Toronto, Ontario, Canada. The road was a six lane elevated expressway in downtown Toronto with a speed limit of 80 km/h and a prevailing traffic speed of 90-95 km/h. The study was conducted between 10 AM and 2 PM, when traffic flows were described as "medium to light." Drivers were exposed to 37 outdoor advertising signs, on both sides of the road. A total of 25 drivers participated, and ranged in age from 25-50 with a minimum of five years of driving experience. Subjects were classified as familiar or unfamiliar based on their prior frequency of using this route. Three dependent measures were analyzed based upon a review of the real-time videotapes of the drives with eye glance data superimposed – average glance duration, maximum glance duration, and number of glances. Each of these measures was calculated for each of the 37 signs.

Four types of signs were present among the 37 encountered. These included: fixed billboards (N=18); Video signs (N=5), Roller Bar signs (apparently similar to Tri-vision [N=2]), and Scrolling Text signs (apparently lamp matrix signs, some inset within larger fixed billboard faces and some independent [N=12]). From these descriptions, it seems that there were no LED-driven digital signs in this study, the type of sign increasingly common in the U.S., and of principal interest in the present report.

As an indication of just how important it is to take note of individual differences, the authors reported that one subject made a total of three glances for all 37 signs, and another made 87 such glances.

The active (all but billboard) signs consistently received longer glance durations and a greater than average percentage of total and long glances, whereas the billboard signs received fewer than average such glances. And, although there were no significant differences in either average glance duration or maximum glance duration for the different sign types, the billboards received significantly fewer glances than any of the

other three sign types. This suggests that drivers attended to the active signs longer, possibly in anticipation of the next message to be presented. With a fixed billboard, of course, the message will not change as a driver approaches it.

When only long-duration glances were considered (those longer than 0.75 second), the authors found that 22% of the total glances were in this category. Of these 194 cases, five (20%) lasted for longer than two seconds. The authors express concern that long glances can pose a serious hazard in close following situations. Since 22 of the 25 subjects made at least one long glance at an advertising sign, the authors conclude that "distraction … was not just an isolated incidence."

The authors compared their findings to several past studies that found that distraction from advertising signs was no greater than other roadside distracters studied, and they conclude that these other studies did not consider active signs as a separate category. The authors suggest that their results demonstrate that active signs may result in greater distraction than past studies of the effects of commercial signing might indicate.

The number of glances per sign per subject showed the greatest sensitivity to sign characteristics. The three active sign types received significantly more glances per sign than did the fixed (billboard) signs. The authors attribute this finding to the knowledge that "human visual systems have evolved to be sensitive to movement in the periphery" (p.6). They postulate that another possible cause of this finding is that the fixed billboards, being an older and cheaper technology, may have been located in less prominent locations than the active signs. In their efforts to explain why roller bar signs captured so many glances when they are essentially fixed signs that are active only during the period of transition from one message to the next, the authors cite anecdotal data from individuals who "say they anticipate and watch for the change to a new message/advertisement" (p.7) on such signs.

The authors' analysis of the angle of glance data indicates that proximity to the central axis of a driver's vision, rather than actual distance from the driver's eye, was a major factor affecting the attention given to a sign.

From the photographs accompanying the published article, it appears as if the measurement of angular displacement from the driver's line of sight understates the true angle. Whereas one would expect zero degrees to be aligned straight ahead of the driver and within the vehicle's lane of travel, the viewing angle designated as zero degrees appears to actually shift out of the driver's lane to the side of the road. This would have the effect of understating the actual angular deviation from line of sight to a given sign.

The authors stated that the signs studied "were all of a similar size when viewed and measured in a video taken prior to the study." Figure 1, however, suggests that this was not the case. Further, some signs were considerably closer to the road edge than others, suggesting that perceived size also must have differed. To the extent that size of a sign (and the consequent size of the largest images or characters that may be displayed on it)

might relate to the number and duration of glances made to it, further explanation would be needed.

The authors did not identify or measure brightness, color, or contrast of the different signs, or indicate how the fidelity of the displayed images compared. While these characteristics might be considered more important at night or in inclement weather, and this study was conducted only during daylight hours, such sign characteristics nonetheless might have contributed to observed differences in glance response.

As discussed above, the authors found that longer glances were consistently made to the three types of "active" signs than to the fixed billboards. This suggests that the study participants were distracted by such signs for longer periods, possibly due to anticipation of the next message to be presented, a condition that does not exist with fixed billboards. The implication for digital signs is that the shorter the period of time for which a given message is presented, and thus the more likely it is that a given approaching driver will see one or more message changes, the more likely it is that a driver will glance at such a sign for a longer period in anticipation of the next message to be displayed. Further, digital billboards display some characteristics of both fixed, traditional billboards and the types of active signs examined here. For example, a digital billboard may display a fixed image to any particular approaching driver, but depending upon its message cycle time, a driver may see one or more different displays. In this way, it is not unlike the roller signs discussed in this study, and, depending upon the display duration and change interval, digital signs may attract the same kind of attention expressed by some of the respondents in this study. Finally, a digital billboard is likely to possess image brightness, color, contrast, and image fidelity far higher than that achieved by any of the four sign types examined by the authors in this study. While the implications of these technological advances suggest that digital billboards would be more effective at capturing attention, this remains an empirical question.

Smiley, A., Persaud, B., Bahar, G., Mollett, C., Lyon, C., Smahel, T., & Kelman, W.L., 2005

After a previous study raised concerns about the number and duration of glances made to video advertising signs along an expressway in Toronto, Ontario, Canada, the City government requested this follow-up study. It included five components:

1. Drivers' eye movements were recorded as they drove past video advertising signs at three downtown intersections and along an urban expressway. Several questions were addressed, including: Do drivers look at video advertising signs; if so how often and for how long? Do these glances come at the expense of glances at traffic related targets?

2. Traffic conflicts were analyzed at two of the intersections, comparing the approach where video signs were visible to the approach where they were not. The question addressed was: Is there an increase in conflicts (that might indicate a lower level of safety) on approaches where video signs were visible?

3. Traffic speeds and headways were measured on the urban expressway before and after the installation of the video sign and on a control section in which no video sign existed. This addressed the question of whether speed variance and short headways increased in the presence of the video sign.

4. Crash data were collected at the three intersections and one expressway location before and after the installation of the video sign to address the question of whether the presence of the video sign was correlated with changes in crash patterns.

5. The public was surveyed at the three downtown intersections to learn about public perception of video signs' effect on traffic safety.

Sixteen test subjects, aged 25-50 years, participated in Study 1. The study was conducted in the summer months, during dry, daytime conditions, between 1-4 PM. Data included recordings from 69 intersection approaches and 14 freeway approaches. The overall findings are as follows:

1. Eye Fixations. All of the video signs attracted attention; the probability of a driver's looking at such a sign upon approach to it was nearly 50%. (This compares to percentages of time looking at official traffic signs (76%), traffic signals and streets signs (7%), and pedestrians who did not threaten conflict (6%). The average glance duration was 0.5 second, similar to glance lengths for official traffic signs, although one-fifth of the video sign glances lasted longer than 0.75 second, and some lasted as long as 1.47 seconds. Since the generally recognized range of minimum perception-reacting time (PRT) of a driver to slowing traffic ahead is 0.75 to 1.5 seconds, glances of 0.75 seconds or longer were considered by the authors to be unsafe. About 38% of glances at the video billboards were made when headways were one second or less and 25% took place when the signs were more than 20° off the line-of-sight; these, too, were considered to be unsafe acts. The authors note, however, that glances at static billboards and bus shelter ads were made at even greater angles and shorter headways. No evidence was found that glances at the video signs reduced the proportion of glances at traffic control devices, although this data is not reported.

The authors discuss the one intersection video sign that was the most distracting as measured both by the percentage of subjects who looked at it and the total number of glances made to it. Surprisingly, this sign was visible for less time than the others studied, was smaller than the other intersection signs, was mounted lower (closer to the driver's line of sight), and was in a less cluttered environment, making it more conspicuous. It was also farther from the driver's line of sight than the other intersection signs. The authors describe it as having "less entertaining" content, although they do not discuss any of the characteristics of its imagery such as its brightness, resolution or contrast. One possible explanation for this seeming inconsistency can best be explained by a comparison of the distracting effects of in-vehicle devices (e.g. entertainment systems) to external-to-vehicle sources (such as the DBBs of interest in this paper). As discussed

elsewhere in the present report, one key difference between these two types of distracters is that, to a large extent, a driver may choose when to divert his attention from the roadside to engage with in-vehicle devices, but can attend to the external distracters only when these are visible to him. In other words, if the momentary task demands on a driver are high, that driver may postpone (or cease, if already begun) his interaction with the non-essential in-vehicle technology. But a billboard, electronic or not, is in a fixed position and, like a call to a driver's mobile phone, the distraction occurs independent of the momentary degree of demand on the driver as the sign is approached. If that billboard is highly attention getting or highly salient to a driver, that driver does not have the luxury of postponing his gaze at the sign; the window of opportunity to view the sign is, in essence, "now or never." And, as reported by Smiley and her colleagues (2004), some drivers will divert their attention from the road for long periods of time *despite* the task demands that they may be facing. Applying this analogy to the unexpected results found for this particular video sign, it is possible that drivers paid more attention to this sign precisely because it was visible to them for less time than the other video signs studied, and therefore provided approaching drivers with a shorter window of opportunity to attend to it once it had captured their attention.

2. Conflicts. The authors looked at the video approaches to two of the intersections to evaluate whether traffic conflicts increased. Conflicts may be seen as indicators of potential crashes, and are increasingly used by traffic safety researchers as surrogates for actual crashes. Conflicts typically examine the kinds of behaviors that are thought to contribute to crashes. In this study, the authors looked at: braking without cause, unwarranted lane deviations, and delayed start-up on green. For five of the six sets of observations (three types of conflicts x two different intersections), no significant differences were found between the video and non-video approaches. However, at one of the intersections, the authors reported a statistically significant increase of drivers who applied their brakes without cause on the video approach. Since the authors chose intersections that had comparable speeds, geometries, and pedestrian activity for the two approaches, they state: "the only reason that could be found for increased braking … was the presence of the video sign" (p. 108).

3. Headway and Speed. Headways and speeds were assessed for the single video sign located on the freeway. Data for these measures was captured from in-road traffic detectors in both northbound (sign visible) and southbound (sign not visible) directions. The results were inconsistent and inconclusive.

4. Crashes. For the three urban intersections, total crashes, injury crashes, and rear-end crashes were studied. Crashes were studied before and after the video signs were erected, and in both the sign visible and sign not visible directions. In the aggregate, there was a non-significant increase in injury crashes and rear-end crashes in the video approaches, as well as a negligible increase in total crashes. When the three intersections were evaluated individually, two demonstrated increases in both total and rear-end crashes; the third showed a non-significant decrease in such crashes. The authors state that the lack of statistical significance may be due to the small numbers of crashes identified. For the freeway environment, crash data on the video approach were compared to crash data for

three different non-video approaches, one of which was deemed the most comparable segment. On this comparison, the authors report a negligible increase in injury collision crash frequencies on the video approach.

5. Public surveys. A total of 152 persons were surveyed at the three studied intersections. 65% of the respondents felt that video advertising signs had a negative effect; 59% said that, as a driver, their attention is drawn to such signs, and 49% of those felt that such signs had a negative effect on traffic safety. The authors were surprised to learn that a large number (9 out of the 152 respondents) stated that they personally had experienced near-crashes, and two had experienced actual rear-end crashes that they associated with video advertising signs. 86% of the respondents suggested that restrictions should be placed on such signs; especially location restrictions (not on highways and not at intersections) and restrictions on brightness levels at night.

In discussing their results, the authors point to an earlier study (Beijer, 2002), discussed earlier in this section, that evaluated a video advertising sign along a different highway in Toronto, and produced dramatically different results. The earlier study found five times the number of glances per subject than did the present study, and three times the glance duration. The authors attribute these differences to the longer sight distance available for the sign previously studied, the uninterrupted view, and the location of this sign on a curve so that it appeared close to the center of an approaching driver's line of sight.

From the single figure included with the report, it appears that the video signs at the three urban intersections were rather small and inconspicuous (sign sizes and dimensional relationships to the roadway are not given). Even given the constraints of image reproduction in the published paper, the exemplar video sign shown was difficult to identify without a circle drawn around it by the authors. In fact, several much larger and more prominent advertising signs were visible in the photograph – signs that were not included in the study. It is not known whether the subject video sign shown in the photograph, and the complex urban environment in which it appears, was representative of all three intersections studied, but at this intersection, at least, it is possible that the presence of larger and more distracting signs might have competed with the studied video sign for an approaching driver's attention.

The single freeway sign studied is described as the only commercial sign visible to northbound traffic. It is further stated that the driver's view of this sign is intermittently obstructed by buildings and overpasses, and that the best visibility occurs during a 5-7 second period before the driver passes the sign. Although data is provided to indicate visibility and legibility distances to each sign, no indication or operational definition is provided as to how these distances were determined. (Given the continuously changing nature of images on a video display, legibility distance would likely vary with changes in the displayed font and letter sizes). In addition, the visibility and legibility distances for the freeway sign excluded times when the sign was obscured from view upon approach, thus suggesting that these distances were discontinuous. It is not known how this discontinuity might have impacted drivers' efforts to view and read the sign as they approached and passed it.

The authors selected their three urban intersections to be similar in speeds, pedestrian activities, and geometry for the video and non-video approach to each. However, this study was conducted in an urban area, and if Figure 1 is representative of the types of intersections studied, there were likely many more potential differences in the built environment that might have contributed to different driver behavior (at the detailed performance levels measured) independent of whether such drivers could or could not see video signs as they approached the studied intersections. This serves as an indication that caution is required when collecting performance data in the real world, because it is rarely possible to recognize, no less control, all possible variables that could have a meaningful effect on performance.

The choice of traffic conflict measures to study is always somewhat subjective. Of the three measures used by these authors, one might question whether other behaviors might have proven more sensitive, or whether the measures chosen might have been confounded by factors unrelated to the video signs under study but more related to characteristics of the urban environment.

Regarding crashes, although statistical significance was achieved in only one measure (rear-end crashes at two of the three intersections in the video approach), seven out of the nine measures taken demonstrated higher numbers of crashes for the video than for the non-video approaches. While these data may point to the contribution of such crashes by the presence of video signs (the lack of significance was attributed by the authors to small data sample sizes), they also point to the difficulty of using crash statistics to study causation. There are many reasons for this. For example, the authors provide no information about how the crash data were reported, obtained, or analyzed. They indicate that they reevaluated one of the intersections because they believed that, due to the placement of the video sign on this one approach, drivers might have seen it earlier than in other cases, and the authors felt that they needed to adjust the location at which they began to collect crash data. While this did not change the results, it suggests just how many subtle and non-controllable factors may influence crash data analysis. Similarly, for the freeway crash analysis, the authors found it difficult to identify comparable sections for the video and non-video approaches. Differences in roadway geometries, driver task demands, and other factors all contribute to the difficulty in interpretation of their findings.

Although the authors provide little information about the actual questions asked, the results of their public survey suggest that drivers and pedestrians are concerned about the safety impacts of video advertising signs, particularly at intersections and on highways, and about excessive brightness at night. Although such findings are clearly subjective, a more complete description of the questions and responses would have assisted the reader in gaining more insight into the respondents' opinions.

The authors, during a brief discussion of the results of an earlier study conducted with a different video sign on a different Toronto area highway, highlight the difficulties facing researchers' abilities to conduct definitive studies of this subject. They state: "Clearly,

some video signs are more distracting than others." While this would appear obvious, it carries with it the concern that there can be no "one size fits all" solution with regard to sign design or operation or with the regulation and control of such signs. It does remind us, however, that there are certain characteristics of sign design, operation, and placement that can be generally understood to contribute to greater distraction and inattention, and that sign operators as well as highway authorities should concentrate on these factors in their efforts to ensure the highest levels of traffic safety in the presence of roadside advertising signs.

It bears repeating that this study evaluated signs that display full-motion, real-time video, something that is prohibited on most billboards in the U.S. although, not, significantly, on on-premise signs. Whereas video advertising might be expected, *a priori*, to be more distracting than fixed message signs, the many variables involved in sign design, operation, and location, make this an empirical question.

The conduct of well controlled, objective studies in this field is notably difficult; it is nearly impossible to find any published study without methodological, analytical or statistical flaws, and devoid of the kinds of real-world variability that makes each sign location different, and contributes to the challenge of conducting definitive research. This study is notable because it includes several different research approaches, including: driver eye movements, traffic flow as measured by speed and headway data, conflicts and crashes, and public opinion. Nonetheless the authors identify several aspects of their study that, because of sample size limitations, roadway geometry incompatibilities, urban environment differences, and even sign size, placement and display properties, made comparisons difficult.

Even though non-video digital billboards were not studied or addressed, several of the findings suggest issues to consider when addressing the potential safety implications of such DBBs. Long sight distances, horizontal curves, and proximity to the road shoulder all suggest higher levels of concern for safety, as do signs at intersections and those that are bright at night. These findings are consistent with results obtained in studies dating back more than 50 years.

This study, as is true for most such investigations, took place during dry weather in daylight conditions, in which driving task demands are likely to be lower than might have been found in the same settings at night or in inclement weather. During daylight conditions, even the brightest signs do not "stand out" from their surroundings as the same signs might do at night and in poor visibility conditions. Since many of the complaints about digital billboards concern their night-time brightness levels (especially when compared to their surroundings), and since inclement weather adds to the driver's cognitive demands, it would be worthwhile to conduct research into the safety aspects of these signs under such "worst case' conditions, since that is what highway designers, traffic engineers, and human factors experts, must design for.

Klauer, Neale, Dingus, Ramsey, & Sudweeks, 2005

This paper, one of several to emerge from the large-scale project known as the "100-Car Naturalistic Driving Study," provides preliminary information about the role of driver inattention in crashes and near-crashes.

The authors discuss the generic limitations of most human factors and traffic safety research that rely upon epidemiological (crash) data or experimental approaches (e.g. simulation, instrumented vehicles); specifically that such studies cannot provide a direct linkage between the types and extent of distraction and a resultant crash or near-crash. Epidemiological studies are constrained by the limited extent and detail of information contained in post-hoc police accident reports which, in turn, are limited by the truthfulness or recall of an involved driver, and by constraints of police time, training, and departmental policies; whereas experimental studies are often limited by restricted sample sizes, an inability to control for extraneous variables, and a necessary reliance on surrogate measures of crash risk, such as speed and lane variation, hard braking, and steering reversals. The 100-Car Study, in contrast, equipped that number of vehicles with sophisticated and unobtrusive instrumentation packages, and placed them in the hands of volunteer drivers for months at a time. These drivers were to use the vehicles however, whenever, and wherever they wished, without constraints and without the presence of an investigator or observer in the vehicle at any time. Data captured by the vehicle's hidden instruments was uploaded periodically to remote computers when the vehicle was parked. With these controls in place, the 100-Car Study met the researchers' operational definition of naturalistic: "Unobtrusive observation. Observation of behavior taking place in its natural setting" (Klauer, et. al., 2006a, p.xv). Of course, this naturalistic method has disadvantages of its own; primary among them is the inability of the researcher to control potentially important variables that may influence the behavior of the participants. As one example, it is unlikely that all participants will pass the same billboard under similar road, traffic, and weather conditions, or that such drivers will be in a similar state of health or alertness at the time.

The results of this phase of the larger study showed that 78% of all crashes and 65% of all near crashes listed driver inattention/distraction as a contributing factor, a much larger contributor, by a factor of three, than previous research had suggested. (Crash database research, for example, suggests that distraction is a factor in approximately 26% of crashes). The authors conclude that the 100-Car Study provides the first *direct* link (i.e. without reliance on surrogate measures) between distraction/inattention and crash causation. Because of the enormous volume of data from the study, it will be left to future analysis to determine the types of inattention most highly associated with crash risk, as well as specific characteristics of inattention events such as long glance durations, following too closely, environmental factors, etc.

Klauer, S.G., Dingus, T.A., Neale, V.L., Sudweeks, J.D. & Ramsey, D.J., 2006a.

This is one report of several that have been presented and/or published from the "100 car naturalistic driving study." This seminal study, and the data that it has

generated, has become a landmark in the assessment of road safety and driver behavior, made possible by advanced, miniaturized data recording technologies that have only recently become widely available. (As this is written, preparation is underway for a greatly expanded follow-up study using this methodology). The authors describe a *naturalistic* study generally as one of unobtrusive observation of drivers in vehicles, in which their behavior is observed (by video cameras) and recorded (by multiple instruments) as they drive normally over an extended period of time. Although the cameras and recording devices were discretely mounted within each of the 100 vehicles driven, these studies are not completely "unobtrusive" in the classical definition of behavioral studies, because the volunteer drivers were aware of their existence. Nonetheless, the study participants used these vehicles daily for their normal routines, over a period of 18 months, and clearly paid little attention to the presence of the onboard recording equipment over time.

This particular project report focused exclusively on driver inattention and its contribution to incidents including crashes, near-crashes and conflicts. Data from crashes and near-crashes were grouped together because it was found that the "kinematic signatures" of each were similar, and using both served to increase the statistical power of the analysis. The data used for analysis was taken directly from the measurement of driver inattention in the five second period immediately prior to a crash or near-crash. For purposes of this study, the authors defined driver inattention as one of four different behaviors: (a) driver involvement in secondary tasks (i.e. tasks irrelevant to the primary driving task); (b) drowsiness; (c) driving-related inattention to the forward roadway; and (d) non-specific eye glance away from the forward roadway. We have some concerns with the authors' operational definition of inattention, for several reasons. First, their definition differs somewhat from definitions of inattention used in other studies. For example, there is no behavior identified here that might be considered "daydreaming" (difficult as that might be to identify), yet this activity is often considered to be a type of inattention. On the other hand, most definitions of *distraction* identify it as a type of inattention that is triggered by some specific event or activity – thus the involvement in secondary tasks, considered inattention here, might be considered distraction elsewhere. Finally, the behavior called "driving-related inattention to the forward roadway," is often considered to be a positive, or appropriate behavior, as discussed below. We also note that some of the same authors, in another report from the 100 car study, use the term distraction interchangeably with inattention (Klauer, et al, 2005).

Among the principal findings were that driving while drowsy increased a driver's near-crash/crash risk by four to six times over the baseline, and engaging in secondary tasks increased this risk by two times for "moderate" secondary tasks, and by three times for "complex" secondary tasks. These findings, of course, are not directly relevant to a study of distraction from roadside billboards, but are reported here because they are representative of behaviors often associated with driver distraction. The study further found that "driving-related inattention to the forward roadway" was *safer* than normal driving – but when this behavior is defined, this finding becomes more plausible. This behavior was characterized by the experimenters as including actions such as checking the rear-view mirror, side view mirrors, vehicle instruments, and other traffic through the

vehicle's side windows or the sides of the windshield. As the authors state: "drivers who are checking their rear-view mirrors are generally alert and engaging in environmental scanning behavior" (p.x). Thus, it is somewhat puzzling that the authors chose to include these behaviors together with other distracters.

Little discussion is provided for the category of most interest to the question of roadside billboards as sources of distraction. Indeed, in their comprehensive listing of all sources of distraction that were categorized in the study (all identified under "secondary tasks" in Appendix A), there are five behaviors identified under the heading of "external distraction." These include specific items (presumably easily identified from the video logs) such as looking at a previous crash or highway incident, looking at a pedestrian or animal outside the vehicle, or looking at a construction zone. There is only one, non-specific, behavior included in this category that might include roadside billboards. This is described as: "driver is looking out of the vehicle at an object of interest that may or may not pose a safety hazard. Objects may or may not be in the forward roadway" (p.134). No further description is provided for this fourth category of distracters.

The findings demonstrated that drowsy driving was a contributing factor in 22-24 percent of crashes and near-crashes during the study, and that secondary-task distraction contributed to more than 22 percent of all crashes and near-crashes. In total, the study found that inattention contributes to more than 45 percent of all crashes and near-crashes that occur in an urban environment. Specific findings for individual secondary task types identified the following categories as indicating a "higher individual near-crash/crash risk when a driver engages in these activities." These specific secondary task types were: "reaching for a moving object, looking at an external object (i.e., long glance), reading, applying makeup, dialing a hand-held device, and eating" (p.34).

This report, part of a much larger study, is comprehensive and data rich. It provides a breakthrough in research methodology that overcomes many of the limitations of previous research. It is, however, time consuming and expensive to conduct, necessarily limited in the number of subjects who can participate because of the costs and commitments involved, and it presents an enormous amount of data that can provide nuanced results but can be difficult and time consuming to reduce and evaluate.

With regard to the potential for distraction from DBBs, the authors report one finding of direct relevance. They state:

> The analysis of eyeglance behavior indicates that total eyes-off-road durations of greater than 2 seconds significantly increased individual near-crash/crash risk whereas eyeglance durations less than 2 seconds did not significantly increase risk relative to normal, baseline driving. The purpose behind an eyeglance away from the roadway is important to consider. An eyeglance directed at a rear-view mirror is a safety-enhancing activity in the larger context of driving while eyeglances at objects inside the vehicle are not safety-enhancing. It is important to remember that scanning the driving environment is an activity that enhances safety as long

> as it is systematic and the drivers' eyes return to the forward view in under 2 seconds (p. xi).

If we substitute the term *digital billboards* for the term *objects inside the vehicle* in the quote immediately above, we can readily see the concern about the potential attention getting properties of DBBs. In addition, if we bring to bear Wierwille's empirically derived limit of 1.6 seconds eyes-off-road time (Wierwille, 1993), reported in Horrey and Wickens (2007), we begin to identify the upper limit of a tolerable level of distraction when looking at DBBs. Adding in the eyes-off-road value of 0.75 second proposed by Smiley and her colleagues (Smiley, Smahel, & Eizenman, 2004; Beijer, Smiley, & Eizenman, 2004) we have perhaps identified the lower and upper bounds of *acceptable* limits of driver distraction from their principal task. When we couple this range of values with a statistical approach that looks at the tails of the distribution instead of, or in addition to, the means, as suggested by Horrey and Wickens (2007), and discussed below, we may now have, subject to validation, both a criterion measure of driver distraction to DBBs and an approach to analyzing empirical data against this criterion.

SWOV Institute for Road Safety Research, 2006

The impetus for this study was a controversy in the Dutch town of Ede. In 2002, seven "life-size" advertising billboards were attached to the façade of a cinema building adjacent to a motorway in this town. The Directorate General for Public Works and Water Management determined that these billboards distracted passing drivers and thus could have an adverse effect on road safety. Thus, the agency asked the town to prohibit them. At the request of both the town and the agency, the research organization TNO investigated the distraction. Four experts concluded that seven billboards were too many, and that drivers had to look away from the road to observe them. They also opined that drivers could choose to ignore the billboards. TNO advised the town to allow a maximum of two billboards, each containing limited information. However, the town granted a permit for all seven. Because this was not an isolated example of questions posed to SWOV about the distracting effect of billboards, the organization undertook this effort to examine the issues and report the results.

The authors begin by stating that the answer to the distraction question is not straightforward, and that it is made more complex because even official roadway information signs can distract motorists from their driving task and thus negatively influence road safety – even though such signs exist to give drivers information intended to improve road safety. The authors write that both advertising and information along the road are intended to draw the attention of passing drivers, thus leading them to shift their attention away from the road and traffic. The difference between these two types of distracters, however, is that roadside information (official traffic signs and signals) "guides the drivers' attention to traffic relevant matters" whereas advertising does not. Therefore, they conclude, it is logical to expect advertising billboards to increase the crash rate.

The report reviews the work of several recent authors, including Wallace (2003), Smiley and her colleagues (2005), and Tantala & Tantala (2005). They summarize these studies by saying that the first two studies found a negative effect of advertising signs at busy intersections and at places where advertising signs might have a similar design or color to traffic control devices; the latter two studies found no *causal* relationship between the signs studied and crashes. Their review of a study by Crundall, et al. (2006) indicated that billboards at eye level captured the attention of drivers both longer and more frequently than billboards elevated three meters above the road surface, particularly for drivers who were given the task of identifying dangerous situations. The SWOV conclusion was: "Precisely in a dangerous situation it is important for the driver to have his attention on the road; an advertising billboard can slow the driver's reaction time, which increases the chance of a crash" (p.2).

They further cite work in Dutch by Wildervanck (1989) who looked at the alerting effect of billboards when placed along a straight and deserted motorway in a monotonous environment, where the driving task is boring and understimulating. Here, according to Wildervanck, the distraction caused by a billboard may have the effect of increasing arousal.

The authors summarize the Dutch regulations on outdoor advertising control. In essence, the Ministry of Transport has authority to regulate billboards only within the national road network. In other cases, complete authority rests with the cognizant province or municipality. After providing examples of the codes and regulations in representative areas of the country, the report suggests future research that may be undertaken.

If crash studies are performed, they should be of large-scale and long duration since such studies are very complicated methodologically. They suggest several possible ways to carry out observational and behavioral research: One is to present two groups of subjects with photographs of the roadside, some with, and some without, billboards. These subjects would be tasked with finding something relevant to traffic. Measurements of reaction time would give an indication of the degree of distraction. A second type of study would show moving images in a driving simulator; the benefit here, the authors report, is that actual changes in driving behavior could be measured. Finally, field experiments could be conducted using instrumented vehicles.

In conclusion, the authors restate that both advertising and information billboards along the road are intended to draw the driver's attention, and this could cause diminished attention to the driving task. This diminished attention could result in more crashes near such billboards. The difference between these two types of billboards is that advertising is irrelevant to the driving task whereas information signs are not. Previous studies have suffered from methodological problems, thus preventing them from reaching reliable (valid) conclusions. It is therefore advisable to do additional research.

They suggest, based upon the strongest findings from past research, that it is better not to place billboards at busy traffic spots, and that billboards should not resemble traffic signs or other traffic indicators. Further, blinking and moving objects have proven to be

difficult to ignore, and thus dynamic billboards are ill-advised. In the past, different levels of government have employed their own guidelines for the placement of billboards along the roadside; unambiguous guidelines are advisable.

This report summarizes and extrapolates from prior research, most of which has been discussed in greater detail elsewhere. As might be expected from such a summary, the report reinforces some of the stronger, more consistent points made in several studies – billboards should not be placed near challenging road settings, especially at or near intersections, and should not resemble official traffic signs in pattern or color. Further, dynamic signs which display motion or include moving parts should not be permitted.

However, while it acknowledges the weaknesses of past accident studies and recognizes the difficulties of conducting such studies in the future, the report makes some questionable suggestions about methods for performing future research. The three types of studies suggested have all been attempted in the past, some with greater success than others, but all suffering from some degree of methodological weakness that causes concern about the validity of their findings. By following the suggestions for future research contained in this report, it is possible that some of these past weaknesses will be repeated.

Because this was primarily a report to summarize and interpret the results of other research and to apply it to the Dutch experience the relevance of this study to our concern about DBBs in the United States is somewhat low. For example, there is no discussion of brightness, display technologies, or message change intervals, and so it offers little applicability to issues related to digital billboards. Nonetheless, this report reaches similar conclusions to other studies in its recommendations to avoid placing billboards near intersections or what the authors call "busy traffic spots," to avoid dynamic or moving billboards, and to prohibit billboards that may be confused with official traffic signs or signals. One principal contribution of this report is its discussion of the billboard regulatory policies in The Netherlands, which may be useful for comparison with policies in other countries and their local jurisdictions.

Road Safety Committee, 2006

In 2005, the Road Safety Committee of the Parliament of Victoria, Australia was tasked with investigating all aspects of driver distraction and producing a series of recommendations to the Parliament for dealing with this growing concern. Their comprehensive report was published in 2006. The report addressed: methods to define and measure distraction, sources of distraction, laws and enforcement issues, vehicles of the future, and long range approaches to address the problem. One chapter addressed "road signs and advertising," and that is the focus of this review. It should be noted that this was not a research project, but rather a compilation of knowledge obtained from numerous sources (research, Government reports, focus groups, specific submissions to the committee's inquiries, etc.) world-wide. The reporting of these reviewed sources was not critical or comprehensive, but was well focused on the specific topics of concern.

The report made mention of outdoor advertising in many forms – including signs on moving vehicles such as those "whose sole purpose is to carry a mobile sign or billboard" (p. 108). In their summary reviews of several studies, and from correspondence with a number of individuals, the Committee concluded:

> The above evidence illustrates a lack of clear and consistent scientifically-based conclusions with respect to the effect of billboards on driver performance. This may be due to methodological deficiencies, lack of sufficiently large or adequately recorded crash circumstances, or unsuitable experimental environments (p. 109).

In a separate subsection, the Committee addressed "video signs/electronic billboards." Although in the U.S. we have traditionally distinguished between electronic billboards (which we may refer to as CEVMS, DBBs or EBBs) and video signs, the Committee considered video signs and electronic billboards together. During its inquiry, the Committee received a presentation from ITS Australia about one particular such sign, and noted that the Committee itself was aware of at least two other large video-style screens. Their conclusion was that "these screens (are at) the high end of potential visual distraction and accordingly, present a risk to drivers" (p. 110).

The committee received a presentation from the Manager of Road User Behavior of VicRoads, who stated, in part:

> What we do know is when there is movement involved, such as flicker or movement in the visual periphery, that this is more likely to capture a driver's attention. We actually are hard-wired as human beings to movement, so particularly moving screens and information that scrolls at intersections and in highly complex driving situations – these are risky, and in particular researchers have been most concerned about those sorts of advertising materials (p. 110).

The report provided an extensive summary of two Canadian studies (Beijer, et al., 2004; Smiley, et al., 2004), and reported that, as a result of the findings of these studies, the Toronto City Council Works Committee introduced interim guidelines for commercial advertising next to expressways and placed a moratorium on new video installations. These two studies are reviewed elsewhere in the present document.

At the conclusion of this section of the report, the authors note that the use of eye-glance technology is enabling new research on the possible distracting effect of road signs and advertising devices, and suggests that "further conclusive studies should be carried out to develop definitive scientific conclusions" (p. 111). They note, however, that some policy implications are already evident, including: (a) the need for separate assessment of sign installations depending on location, (b) that VicRoads and other governmental agencies at the municipal level (should) "develop a more consistent and stringent approach to the installation, use and content of scrolling, moving and video-style advertising within and adjacent to road reserves," and (c) that any such advertising sign installations should be monitored for their effect on safety.

Finally, the report includes an extensive discussion about guidelines and practices for advertising signs. This will be discussed in our separate review of guidelines in Section 5 of this report.

Klauer, Sudweeks, Hickman, & Neale, 2006b

This variant of the 100-Car Study concentrated on specific unsafe driving behaviors. The authors provide a succinct and highly readable overview of the assumptions, equipment, methods and measures of the 100-Car Study, and then report, in detail, about the four specific unsafe behaviors that were found to contribute to crashes and near-crashes. These behaviors were: driving at inappropriate speeds, driving while drowsy, driving aggressively, and, the factor of greatest interest to the current study, inattention/distraction, as measured by the driver's eyes off the roadway for greater than two seconds. Under these conditions, the odds of a crash or near-crash were nearly twice those when the driver attended to the forward roadway.

Highlighting some of the limitations of previous research approaches (particularly post-hoc, epidemiological crash studies and in-vehicle human factors studies) the authors presented several interesting findings. For example, whereas previous studies tended to show that distraction/inattention was a factor in approximately 20% (Treat, et. al., [1979]) to 23% (Hendricks, et. al., [1999]) of crashes, the 100-Car study (Klauer, et al, [2006a]) found that inattention and secondary task engagement (grouped together for analysis) contributed to nearly 60% of crashes. There are two interrelated reasons why these differences were found. First, the 100-Car Study demonstrated that the "kinematics" of crashes and near-crashes were similar; i.e. they involved comparable levels of driver emergency actions such as swerving and hard braking. And second, of the 69 crashes recorded in the 100-Car Study, 57, or 83%, were not reported to the police. Thus, research studies that analyze crash data are likely to substantially underreport the percentage of crashes attributed to inattention/distraction, both because they are unable to obtain data on near-crashes (sometimes called near misses or traffic conflicts), and because those crashes that do occur are reported to police less than 20% of the time. This characteristic also suggests that studies that examine near-crashes as surrogates for actual crashes can be useful in studies of distraction and inattention. As the authors explain: "The primary difference between a crash and a near-crash is a successful evasive maneuver. Thus, crashes lead to property damage, injury, and possibly death, but near-crashes do not, even though they have similar properties. Including both … greatly improves the statistical precision of the estimates, and appears to be a promising technique for use in future research" (p.11).

Interestingly, despite demonstrating a level of contribution to crashes from distraction at rates only about one-third as high as the 100-Car Study, both Treat and Hendricks and their respective colleagues found that driver distraction/inattention was the most-frequently cited contributing factor to such crashes.

Restating one of the key findings of this study, (and the one most relevant to the present project), the authors explained that looking away from the forward roadway for greater than two seconds was associated with a near doubling of the odds of being in a crash or near-crash, and Klauer, et. al. [2006a]) concluded that there is increasing evidence that "tasks requiring longer and more frequent glances are detrimental to safe driving" (p.72). Citing Stutts, et al. (2003), the authors state: "Driving a vehicle is a psychomotor task, and continually monitoring the roadway and anticipating the actions of other drivers are critical for operating a motor vehicle safely. A distracted or inattentive driver is likely to have delayed recognition or no recognition of information necessary for safe driving" (pp16-17).

Crundall, Van Loon, and Underwood, 2006

This English laboratory study addressed a type of outdoor advertising that is not directly related to the DBBs that are the subject of the present study. Specifically, Crundall and his colleagues looked at fixed posters mounted either at street level ("street-level advertisements," or SLAs) such as those on bus shelters, newsstands, or telephone kiosks, and posters located above ground on poles or streetlights ("raised level advertisements," or RLAs). The size of the advertising posters studied was 1.8m x 1.2m (approximately 6ft. x 4 ft.) in a vertical format. As such, these advertising signs were more representative of signs that might be seen in urban environments in the U.S., rather than the typical 14ft. x 48ft. size digital billboards that are the subject of the present study. Nonetheless, the hypotheses made by these authors offer a different perspective than those that have generally been adopted by researchers in this field, and their conclusions shed new light on the issue of roadside advertising and driver distraction.

The authors discuss the potentially detrimental effects of roadside advertising in a manner similar to other researchers. As they describe it, in undemanding situations drivers have "spare attentional capacity" that they can use to permit their eyes to wander to objects in the visual field, including those, such as advertisements, that are irrelevant to their driving task; however when the cognitive demands imposed on the driver (such as from traffic, weather, roadway geometry, vehicle performance or personal factors such as fatigue) become greater, this spare capacity diminishes, and eye movements must focus on the task at hand. If an advertisement within the driver's visual field attracts visual fixations under these conditions, sufficient spare capacity may not be available to attend to it, and thus the advertisement draws from the limited attentional capacity that is needed to safely perform the task. Thus, although the authors initially suggest that roadside advertisements are intended to attract a driver's spare capacity, they go on to describe the interest that advertisers have in placing their signs in locations where the driving task demands may be high. They cite (as have others) the 1967 before-and-after study by Ady, who found that an "eye-catching" billboard at the apex of a curve led to more accidents than similar signs in control locations.

The authors suggest that, because it is possible to identify fixed roadside "hazards" (such as dangerous curves, complex interchanges, etc.), it is therefore possible to ensure that roadside advertisements are not located in such areas. Their greater concern, however, is

with what they call transient hazards, such as changes in traffic density, path intrusion from another vehicle, or a pedestrian crossing the driver's path from between parked cars. Transient hazards cannot be predicted in time or location. Because such unforeseen events can directly influence a driver's probability of an accident, "if attention is distracted by an advertisement during the onset of a sudden (transient) hazard, the chance of an accident occurring will increase" (p.672). Knowing that roadside advertisements do attract driver's attention (as per Hughes and Cole, 1986, and others) and that drivers' glances at such advertisements may be made under unsafe conditions such as short headways (as per Smiley at al., 2004), the authors set out to determine whether SLAs or RLAs tend to attract more attention when drivers are looking for hazards.

The most relevant environmental (including traffic and roadway) information important to hazard detection is distributed primarily along a horizontal plane, with the straight-ahead view (the focus of expansion) at the center of this distribution. As a result, as the authors have demonstrated in prior research (Chapman and Underwood, 1998), the majority of visual fixations will fall within a horizontal window when the driver is looking for driving-relevant information, including potential hazards.

These earlier findings lead to their belief that, if an advertisement is located within this "horizontal window of inspection" it will receive more fixations than will other advertisements. Although such fixations on the advertisement may be immaterial to safety when the driver has spare attentional capacity, those fixations that occur during a visual search for hazards and other driving-relevant information are likely to be unintentional and may distract the driver and serve to interrupt this critical visual search activity.

The principal research hypotheses tested, therefore, were that, during high demand conditions, when drivers were primed to look for hazards, SLAs would receive the most attention, whereas during periods of reduced demands, when spare capacity was greater, the attention given to RLAs would increase.

The study was conducted in a laboratory, where participants viewed video clips that had been previously recorded from the dashboard of a moving car. Of 34 clips created, half included SLAs and half depicted RLAs. All were essentially equal in size (1.8m x 1.2m), and all were filmed during daylight. The clips ranged from 42 to 61 seconds in duration, and the time when an advertisement first appeared within each clip was randomized. The clips were projected onto a screen 2m in front of the participant and subtended a visual angle of 33° x 27° horizontal. Participants' eye movements were recorded and superimposed on the video for analysis. Two different test conditions were established via the instructions given to the participants. In the "hazard group" the participants were instructed to concentrate on the hazardous nature of each video clip. In the "advertisement group" participants had less emphasis placed on the hazard perception task and, in addition, were told to watch out for advertisements that they might pass. The intent of the instructional set was to create differences in the task demands during visual search – high demand when scanning for hazards; lower demand when still looking for hazards but also attending to irrelevant stimuli.

Results showed significant differences between the two groups in several areas. SLAs were fixated earlier, received more fixations, and received a greater total gaze duration compared to RLAs. In addition, the mean length of advertisement fixations was greater than the mean length of fixations for the entire clip, with one exception. Fixations on the RLAs were lower than the clip averages for the hazard group, suggesting that, as had been found previously, the scanning for hazards takes place essentially within the horizontal plane in front of the driver. A post-drive hazard rating showed that clips with SLAs were judged more hazardous than clips with RLAs.

Our review raised a number of questions about the methods and protocols used in this study, and about their possible effects on the findings. For example, the authors do not provide the text of the actual instructions given to the participants; as a result it is unclear just what the task was for those in the "advertisement" group. There is no description of any of the visual information (except the advertisements) within any of the clips shown, and thus one does not know the implications of the finding that the SLAs were fixated to a greater degree than the clip average, a potentially important observation. Further, with clip durations of one minute or less, the presence of advertisements within the scene may have become expected during the course of the trials, despite their randomized placement within each clip. Finally, as discussed elsewhere in the present report, it might have been useful to have comparisons between values in the tails of the distribution (e.g. the longest glances) in addition to the means.

Despite our uncertainty about some of the details of this study, one relevant finding in particular is a cause for concern regarding the potential effect of roadside advertising on traffic safety. The authors describe, based on their prior research (Chapman and Underwood, 1998, Crundall et al, 1999) hazard perception searches in visually cluttered environments as displaying higher sampling rates and shorter fixation durations than in less complex environments, until a hazard is detected, at which point the fixation durations of the hazard itself increase. The findings of this study suggest that the SLAs showed "similar effects on fixation durations as an actual hazard, stopping search for other hazards, and potentially reducing peripheral attention, as increased resources are devoted to the fixated stimulus" (p.675). In other words, when scanning the environment for hazards, drivers in this study unintentionally attended to a roadside advertisement that was within their scanning window, and then increased the duration of their glances at the advertisement to the same extent that they would have done to an actual hazard, and at the expense of their continued scanning for hazards, even when they were instructed to search for the hazards. This finding is quite similar to that expressed by Beijer (2002), who reported that, although higher levels of task demand were associated with a reduction in the *number* of glances made to the signs, the average and maximum *duration* of these glances was not reduced as task demands increased. As Beijer states: "This would seem to indicate that drivers are comfortable turning their attention away from the road for a set period of time, regardless of the demands of the driving task" (p. 76).

Another finding from Crundall, et al. also raises concern. The authors cite a study by Boersma (1989) that suggests that visual clutter in the observed environment tends to

increase the visual search time for a target of interest, and studies by Eriksen and Eriksen (1974) and Logan (1996) that demonstrated that the proximity of distracters to a target increases the amount of time required to respond to the target. Crundall, et al. conclude that the embedded nature of SLAs within a complex scene may produce the same result, i.e. increasing the time required for a driver engaged in proper scanning behavior to locate and respond to a real hazard that may be present.

If the two findings of this study can be replicated in other research more germane to the U.S. roadway network and to the type, size, and location of typical DBBs, then the implication is that such signs can attract and hold drivers' attention, even unintentionally, at the expense of their need to scan the environment for immediately relevant hazards, and that the mere presence of a DBB in the visual environment can increase the time required to identify and respond to a present hazard.

Horrey and Wickens, 2007

This paper does not address billboards of any kind; rather it discusses the duration of glances to irrelevant stimuli inside the vehicle. It is reported here because it proposes a novel statistical methodology that is highly relevant to future studies of the potential impact of roadside DBBs. In fact, two of the relevant studies discussed in the present report make use of this analysis technique (Lee, et al., 2007, Chan, et al., 2008).

The assumption underlying the authors' approach is simple and logical. Motor vehicle crashes are rare events, in part because the unsafe circumstances or conditions that lead to a crash do not usually lie at the mean (or center) of a given statistical distribution; rather at the extremes, or tails. In other words, many crashes are a result of unusual or unexpected conditions, not conditions that we would think of as normative. The authors cite, as one example, that it may be the unusually slow response time to a traffic obstacle, not the average response, which results in a crash. And they discuss a recommendation from a consortium of automobile manufacturers that in-vehicle "infotainment" systems not require a driver's glance duration that exceeds two seconds. In short, our concerns in road safety are typically with "upper limits" of the metrics used to describe behaviors – we are generally not interested in mean following distances, or mean reaction time to hazards, or mean BAC levels of drivers. In all these cases, and many others, we are interested in cut points that enable us to distinguish the safe from the unsafe – and these are typically found in the upper limits of a distribution. The authors find it puzzling, therefore, that many research studies continue to report on the average response, rather than the extreme. In short, it is often the slowest response, or the longest glance, that enables us to reach meaningful conclusions about safety related concerns.

In this study, the authors collected data in a driving simulator to study glance durations to an in-vehicle display. They then set out to show how an analysis of the average or mean glance duration could produce results, and therefore lead to conclusions and recommendations, that were quite different than using the same experimental data but analyzing the tails or extremes of the data. Their results showed that analysis of the mean glance duration did not clearly distinguish between tasks of varying difficulty. When

analyzing the tails of the distribution for the same experimental data, however, the authors found very large differences, and these differences had implications for hazard response time and, therefore, crash potential. As a result of their findings, the authors revised a crash risk model that they had previously proposed. The revised model has not yet been validated due to a lack of data, but the results from this study demonstrate its viability.

With regard to our interest in the potentially distracting effects of DBBs, this revised model bears direct relevance. Based on the findings of recent studies (Smiley, et al., 2004; Wierwille, 1993; Klauer, et al., 2006a) we have reason to believe that when a driver takes his eyes off the road for a certain extended period (0.75 second, 1.6 seconds, or 2.0 seconds, respectively), he has a much higher crash likelihood than would be expected from distractions of shorter duration. Thus, in future studies of driver response to DBBs, we should be looking, not only for mean values of the number and duration of glances at such signs, but at the greatest number and longest duration glances, values which are found at the tails of the data distributions. As stated above, the recent study by Chan and her colleagues (2008), discussed below, has made use of this methodology. And the industry-sponsored study by Lee et al. (2007), discussed in Section 3 of the present report, recommended this approach to data analysis, and collected data that supported such an analysis, but did not actually perform this tails analysis on maximum glance duration, a key measure in the understanding of distraction from DBBs..

Clark and Davies, 2007

The purpose of this study was to investigate how a driver's reaction time to driving relevant information was affected by different levels of out-of-vehicle distraction, and whether these impacts were related to a driver's level of expertise.

The study was a laboratory simulation in which participants (54 college students, half male and half female, with three different levels of driving experience) responded to official road signs in the presence and absence of distracter signs. There were four types of each sign. The principal driving task was to use the simulator's steering wheel to keep a crosshair in the center of a target that followed the road curvature. The response task was to tap the brake pedal as quickly as possible in response to the appearance of one of the official road signs, which were selected from the UK Highway Code website (http://www.highwaycode.gov.uk).

We had a number of concerns with the design and execution of this study, most of which are acknowledged by the authors. One concern that was not addressed is that the road sign stimuli could appear in any one of 10 different positions on the display screen, a far different case than exists in the real world. A second concern is that each stimulus (both road sign and distracter) appeared suddenly on the screen and remained visible for exactly two seconds. In the real world, signs appear in the distance, often before they can be read, and become clearer and larger as they are approached. In this study, the sudden "on" and "off" appearance of signs of interest might well have influenced participant behavior in ways that would not occur on the road. Further, in the four "load" conditions

(no load featuring no distracters, low load with three, high load with six, and "overload" with ten), all of the distracter signs, as well as the target official sign, were presented at the same time, around the perimeter of the display. Responses to this rather unrealistic display might not translate very well to the real world in which signs appear in fairly limited and well defined locations, and in which they appear at different times and for different intervals. Nonetheless, the study produced some interesting findings; findings which are quite consistent with the results of other studies employing very different methodological approaches, and discussed elsewhere in the present report. Whereas driving expertise had no influence on response (reaction time to the simulated road stimuli), the number of distracters did. Specifically, a significant increase in reaction time was found between the no distracter condition and the two highest distracter conditions, although there was no significant difference between the no-load and low-load conditions. There was, however, a consistent increase in reaction time to the road signs as load from distracting stimuli increased, suggesting that the higher loading driving tasks (as represented by the number of advertisements visible) were "detrimental to road safety." The implications of this study are that advertisements should be kept to a minimum at busy junctions and areas where drivers need to concentrate" (unpaginated).

Lee, McElheny, & Gibbons (2007).

This paper is discussed in Section 3, "Industry sponsored research."

Perception Research Services (2007)

This paper is discussed in Section 3, "Industry sponsored research."

Shinar, 2007

In his recently published, comprehensive book on the human factors of traffic safety, Shinar devotes a chapter to distraction, its definitions, causes, and effects, and a section within this chapter on distraction from road signs and billboards.

The author poses a paradox that has confronted researchers in this field for many years. Because roadside commercial billboards, particularly the latest digital billboards, are specifically designed to attract a driver's attention (and billboard owners and operators tout their success at doing so in their promotions to potential customers), we would expect them to be a significant source of distraction. Indeed, as discussed elsewhere in the present report, numerous studies have shown that drivers do direct their gaze to billboards as they drive. Yet several studies have demonstrated that despite drivers' glances toward billboards, there has been little observed adverse impact on driving performance. In an effort to better understand this paradox, Shinar and his colleagues conducted an on-road study using 16 experienced drivers and an instrumented vehicle. The route took the participants past a large, attention-getting billboard in one direction and then followed the same roads in the opposite direction from which the billboard was not visible. A camera hidden below the vehicle's rear-view mirror recorded the participants' direction of gaze. Results showed that drivers looked to the right (in the general direction of the billboard) 23% of the time when the billboard could be seen, but

only 10% of the time when the billboard was not visible to them. Drivers' time spent looking forward at the road and traffic was effectively the same regardless of whether or not the billboard was visible. Shinar believes that the billboard attracted the drivers' spare attentional capacity that might otherwise have been spent looking at other objects equally irrelevant to the driving task. He concludes: "Thus, drivers were able to allocate a significant amount of their attention to the sign but they did not do that at the expense of the attention that they allocated to monitoring the road and traffic" (p. 528).

Shinar's discussion suggests that drivers are willing and able to devote their attention to billboards when their task demands are low, and when the billboard provides greater interest than other roadside objects, but that, as their cognitive demands increase, drivers will devote less attention to these roadside distracters. Other studies, and the billboard industry, have suggested the same thing. And this may well be the case for some drivers, some of the time. But this begs the real question. Because of the considerable expense of new, digital billboards, they tend to be placed only in areas with high traffic volumes. In addition, because advertising space (and, with digital billboards, time) is sold to advertisers based on the number of eyes that will pass the billboard each hour or each day, such billboards tend to be located where they can be seen by the greatest possible number of drivers. This explains why billboards are often placed near highway interchanges and along horizontal curves where they can appear directly within the cone of vision of approaching drivers for extended distances. Thus, DBBs tend to be located in areas where task demands are likely to be high, and, billboard owners claim, (and present data to show), they attract the gaze of large numbers of drivers.

Conducting the kind of research that would be necessary to prove that drivers attend to billboards when they have spare capacity, and concentrate on the road when they do not, is a challenge that, to our knowledge, has not yet been undertaken. We do know, however, that several recent studies (e.g. Smiley, et al. 2005; Lee, et al. 2007; and Chan, et al., 2008) have produced data showing that some drivers attend to billboards for extended glance durations that have been shown, in other studies (e.g. Klauer, et al., 2006a) to be unsafe. To date, however, only the Chan, et al., study controlled for and reported on the task demands that their participants faced while engaging in these glances toward external distracters. Further, we know of only one study (Lee, et al., 2007) that collected data on drivers passing DBBs at night, when such signs can be most conspicuous (because of their location, size, and brightness), and may be most likely to cause high levels of distraction. Although their data was preliminary and based on only a few participants, Lee and her colleagues showed that DBBs, as might have been predicted, captured more and longer glances at night than other roadside distracters, and they have suggested that, had a full study (rather than the pilot study that they performed) been conducted, these differences might have reached statistical significance.

Also, we must recognize that not all drivers are willing or able to safely switch their attention from roadside distracters to the driving task itself when needed. In particular, younger drivers, not yet sufficiently skilled to understand risky situations, and older drivers who may be more easily distracted and who are typically poorer than their

younger cohort at quickly shifting attention, may be particularly at risk under such circumstances.

Finally, although accidents are (thankfully) rare events, they are, by definition, unexpected. As Shinar states: "One way to reduce the effort involved in driving, is to estimate the amount of attention that is required and then allocate to the driving a portion of our capacity that is somewhere between the minimum required and the maximum we have. ... The problem we encounter in driving is our inability to anticipate many of the rapid changes in the amount required – as when a driver ahead of us suddenly and unexpectedly brakes" (p. 518). It is precisely this difficulty that leads traffic safety experts to be concerned about the compelling power to distract a driver when it is always possible that such distraction cannot be tolerated at the moment it occurs.

Tantala & Tantala (2007).

This paper is discussed in Section 3, "Industry sponsored research."

Young, M.S., & Mahfoud, J.M., 2007

This well controlled, well documented study includes excellent summary of the literature, and particularly the most recent literature. It employed a fixed-base, interactive driving simulator with a 60° forward field of view (FOV) horizontal, and a 40° FOV vertical. Forty-eight participants drove three simulated routes in either the presence or absence of four roadside billboards. The routes consisted of 3.0 miles of urban driving, 5.7 miles of motorway driving, and 2.8 miles of rural driving. All participants experienced all six conditions, the order of which was counterbalanced across participants. Participants were not told the purpose of the study, but were asked to drive as they normally would, and to maintain the posted speed as closely as possible. The typical run lasted between five and six minutes.

The independent variable was the presence or absence of billboards. Billboards were fixed (static) signs, three on the left side of the road and one on the right. The billboards were placed into the route at semi-random locations, ensuring that they were spaced apart at relatively equal distances, and that they did not cover, nor were covered by, other road signs. Since it appears as if all runs were conducted under simulated daylight conditions, lighting of the billboards was not considered.

Dependent variables included those to evaluate driver performance and attentional factors. Longitudinal control was assessed by time to contact (TTC). Lateral control was assessed by the number of lane excursions, and time out of lane; the metric used for this determination was not specified. Only left edge excursions were recorded and analyzed, since right lane excursions could have been indicative of intentional passing maneuvers. (The study was conducted in the UK, where vehicles drive on the left). Total crashes were also recorded.

Driver attention was assessed in several ways. Mental workload (MWL) was measured through the NASA-TLX scale, given to each participant at the end of each run. Participants were also asked to recall the last road sign that they passed, and, when present, the last billboard. Driver eye movements were also recorded, and provided data on number of glances and glance durations.

The study found that the presence of billboards adversely affected driving performance in terms of lateral control and crashes. Longitudinal control was not adversely affected. These findings would suggest an increase in side-swipe crashes vs. rear-end crashes, but no information is provided as to the types of crashes found. The presence of billboards also had an adverse impact on driver attention in terms of the number of glances made at billboards. This finding is consistent with earlier work by Wierwille who noted that drivers respond to the demands of in-car tasks by altering their attention such that they made more short glances. The presence of billboards was also associated with higher subjective mental workload. In addition, the recall of road signs was adversely affected by billboards on the motorway and rural routes. The authors interpreted this finding to mean that drivers were attending to billboards instead of relevant road signs under these conditions.

The authors conclude with a "persuasive overall conclusion that advertising has adverse effects on driving performance and driver attention" (p.18).

Because this was a simulator study, it represents the expected strengths (full control over independent variables, assurance that all participants experienced the same conditions, etc.) and weaknesses (artificiality of the visual environment, two-dimensional representation of three-dimensional space, etc.) of this technology. Simulator limitations may be of particular concern when studying DBBs because the signs being investigated require high visual fidelity of both the stimuli and the environment in which they are located. In addition, the simulator used in this study was limited to a 60° horizontal and a 40° vertical field of view. It is possible that a wider field of view would have yielded different results, in that the field of view might have better represented a driver's scanning behavior while driving.

Although the report depicted examples of the official signs and billboards used, it would have been helpful for the authors to have included a chart showing all signs that were used together with more details about their sizes and placements. As written, important issues such as sign and billboard size, distance from the road edge, and elevation, are unknown. Although the authors kept track of crashes that occurred (they did not perform any statistical analysis of crashes due to low absolute numbers [8]), they did not indicate whether or not the crash characteristics were consistent with driver distraction or inattention. Thus, it is not possible to know whether crash types were correlated with the findings of lateral and longitudinal control.

The study examined only traditional, fixed, billboards; electronic or digital billboards were not analyzed. Thus, the direct relevance of its findings to DBBs cannot be assessed. As suggested above, we believe that simulation may not be the ideal methodology to

study EBBs because it is difficult, if not impossible, to faithfully reproduce the visual characteristics of such signs (brightness, depth and fidelity of the graphic image) in the simulation environment due to limitations on the graphics processing capability of most simulation systems. Indeed, even in today's most sophisticated driving simulators, it is necessary to design signs that are oversized in order to realistically represent sight distances at which the messages on such signs can be read in the real world, and the complexity of the real world visual environments in which DBBs are most likely to be found remains a challenging task to recreate in simulation.

Chan, Pradhan, Knodler, Pollatsek and Fisher, 2008

In an important new study on this issue, Chan and her colleagues review the literature on driver distraction caused by both in-vehicle and external-to-the-vehicle events, and report that distraction has increasingly been shown to be a particular problem among young, novice drivers. They cite a recent Finnish study (Wikman, et al., 1998) which found that, although the *average* duration of distraction episodes did not differ between experienced and inexperienced drivers, the *distribution* of such glance behavior differed significantly between these groups. Only 13% of experienced drivers had distraction episodes of at least 2.5 seconds, vs. 46% of the inexperienced drivers. Similarly, none of the experienced drivers had distraction episodes of 3 seconds or longer, whereas 29% of the inexperienced drivers did (p. 8).

The purpose of their study was to compare the distribution of distraction episodes of newly licensed and experienced drivers specifically for distracters external to the vehicle. The authors were particularly concerned with the behavior of newly-licensed (16-17 year old) drivers because this cohort presents greatly elevated crash risk, and because extended episodes of distraction were thought likely to further degrade their demonstrated poor hazard anticipation skills. And, although there is considerable literature that addresses distraction of younger drivers from sources and activities inside the vehicle, there is no comparable literature for external to the vehicle distraction. The authors theorize that the data for external distraction may well be different from findings of internal distraction. They believe that this may occur, in part, because when drivers are looking within the vehicle, it should be obvious to them that they are not processing relevant roadway information; whereas, when a driver is looking at sources outside the vehicle, whether an advertising sign, a street sign, or some other scene or object, it is likely that the forward roadway is still somewhere within the driver's field of view, and thus it may not be obvious to him (particularly if inexperienced) that this important information is not being fully processed since it is peripheral, unattended, or both.

The authors review the extensive literature that demonstrates that objects that are not fixated or attended to receive little cognitive processing, and that reduced attention impairs the speed of identification of an object or even an event such as a change in brightness. They cite a study by Muttart, et al. (2007) that demonstrated that drivers are slow to respond to a car ahead of them that has stopped slowly when they are performing a simulated cell phone task, even when that task does not require any visual processing.

In the present study, a total of 24 participants, half male and half female, were divided into a younger, inexperienced group (newly licensed drivers or those with learner's permits) and an older, more experienced group (at least five years of driving experience). They drove a high-fidelity driving simulator along a five mile route that included both urban and rural sections. Five in-vehicle and 18 out-of-vehicle tasks were used as distracters. The latter consisted of a target search in which the participants had to search for and indicate the presence or absence of a target letter in a 5x5 letter grid that appeared on the side of the road. The grid simulated a sign 10 feet wide by 10 feet high, located eight feet from the left or right road edge. When driving at the posted speed limit, a participant would have been able to view the sign for 4.5 seconds.

Since the authors were primarily interested in the longest glances away from the forward roadway (since these have been implicated in prior studies [see, for example, Horrey and Wickens, 2007] as major contributors to crashes), they used as their dependent measure the maximum time that drivers spent continuously looking away from the forward roadway during a specific distraction task. They used the mean length of these maximum episodes to compare their experienced and inexperienced drivers on the in-vehicle and out of vehicle distraction tasks. The results were enlightening and somewhat surprising.

For the in-vehicle distracters they found, as they had anticipated, that there were significant differences between the experienced (1.63 seconds) and inexperienced (2.76 seconds) drivers. None of the experienced drivers had average distraction durations of more than 2.3 seconds, but eight of the inexperienced drivers did. They also looked for patterns in these distributions and found that the inexperienced drivers showed a consistent pattern of looking away from the roadway for longer periods of time than the experienced drivers. Finally, when looking at episodes of distraction lasting longer than two seconds (the threshold of concern in some prior studies), they found substantial differences. A highly significant difference of 20% of scenarios in which experienced drivers looked away from the roadway for more than 2 seconds vs. 57% of scenarios for inexperienced drivers added to the confirmation of their hypothesis.

For distraction external to the vehicle, the topic of most interest in the present report, the data was very different, and very informative. The two most important differences from the in-vehicle glance behavior were that: (a) there was very little difference in the duration of distraction episodes between the experienced (3.41 seconds) and inexperienced (3.67 seconds) drivers on the outside-the vehicle distraction tasks, and (b) the maximum episode distraction durations were significantly longer for the out-of-vehicle tasks (3.54 seconds) than for the in-vehicle tasks (2.19 seconds). The two experience cohorts also showed few differences in the percentage of distraction episodes longer than 2, 2.5, and 3 seconds, in all cases longer for the external than for the in-vehicle distracters. These findings, the authors conclude, demonstrate that "drivers are more willing to make extended glances external to the vehicle than internal to the vehicle" (p. 17).

In discussing their results, Chan and her colleagues compare their findings to those of Wikman et al. who performed their analysis on-road. The data from the two studies is in

strong agreement, and provides evidence to support the viability of using a driving simulator to study driver viewing behavior. In reviewing their data on external distraction and relating it to the earlier work of Klauer et al. (2006a), Muttart et al. (2007), and others, these authors express concern that "it is likely that our out-of-vehicle tasks (which not only engage attention but also draw the eyes and visual attention away from in front of the vehicle) would have quite significant detrimental effects on processing the roadway in front of the vehicle (p. 22)."

Lazarus, 2008

As a result of the erection of four DBBs on major arterial roadways in Salem, Oregon, one of which was visible to traffic on I-5, the Oregon Department of Transportation (ODOT) and the City of Salem undertook a literature review to better understand national perspectives on the issue and to assist local and State officials to determine future actions that they might take. This review (Lazarus, 2008) was issued in June, 2008. The concern that prompted the report is based on the premise that newer, larger DBBs are clearer from greater distances than older billboards, and that their intent, to relay advertising messages to the consumer, places them "in direct competition for the attention needed to operate a motor vehicle" (p. 2). Lazarus expresses concern that, in certain cases, DBBs installed in a city and intended for city arterials are also visible to drivers on other nearby highways. This raises questions of the applicability of billboard control laws governing different roads and operating under different jurisdictions. Because these signs are larger and brighter than previous advertising devices, questions are also raised about a driver's line of sight to the sign, and about the potential for distraction.

Lazarus briefly reviews some of the relevant research in areas of traffic safety and current regulations and guidance, He cites a web log which discusses some of the diverse billboard laws and guidelines, and points out the lack of uniformity in controls that exist from State to State (Webpavement WebBlog, 2005, cited in Lazarus, 2008).

Speirs, Winmill & Kazi, 2008

On behalf of the Highways Agency (HA) of the United Kingdom, WSP Development and Transportation prepared a report which addressed the relationship between billboards and driver distraction (Speirs, Winmill & Kazi, 2008). The report included a discussion of, but was not limited to, DBBs, and investigated the issue from multiple directions:

- A review of policies and guidelines on outdoor advertising in place at various local and national agencies
- A review of published research on driver distraction and roadside advertising, with a focus on work performed in the UK
- A review of decisions by the body (The Planning Inspectorate) that decides "to either grant or refute express consent to display roadside advertisements" (p. 24).

- An investigation of the relationship between outdoor advertising clusters and accidents at two specific locations
- Interviews with diverse stakeholders, and
- An exploration of public opinion through a series of three focus groups and an on-line survey.

Although much of the content of this study is outside the scope of interest for our report (e.g. considerable attention is paid to illegal roadside billboards painted on the side of trailers in farm fields), there are numerous insights gained, largely from focus groups and surveys, that add to our knowledge.

The report begins with a useful discussion of the concept of driver distraction, and an excerpt from a statement by the Royal Society for the Prevention of Accidents (RoSPA) that

> distracted driv ers underestimate the effects that distraction has on them and do not perceive their reduced awareness or ability to spot hazards. Distracted drivers also have difficulty controlling their speed and their distance from the vehicle in front, and their lane position can vary drastically. … The more complex or involved a driver becomes with a distraction, the more detrimental the distraction is to his or her ability to make observations and control the vehicle safely (p. 5-6).

This language is not dissimilar to hypotheses described by Chan, et al (2008) in their recent simulator-based study. The discussion of distraction further references the work by Crundall, et al, 2006) who found that drivers become distracted because of their compulsion to stare at something due to the psychological difficulty in abandoning a task which has not been completed. (This is known as the Zeigarnik Effect, and is further discussed in Section 3 of this report. The authors also discuss a study by Theeuwes, et al. (1998), who found, in a laboratory study, that participants did not have voluntary control over distraction; that even when they were tasked with concentrating on one colored shape while ignoring shapes of other colors, "they were unable to ignore the 'distracters' regardless of their effort to do so" (p. 379). These findings, if generalizable to the real world, suggest that drivers may not be as able to ignore the messages on attention-getting billboards as some have claimed. Recent work by Wallace (2003a, 2003b) is also discussed, specifically with regard to personal factors such as driver age, level of fatigue, and alcohol consumption, all of which are believed to play a role in distraction. Finally, the authors cite current work by the UK Department for Transit (DfT), which is attempting to identify gaps in existing research on distraction and will initially involve the development of an operational definition of the term driver distraction.

Within a brief discussion of internal- and external-to-the-vehicle distraction, the authors discuss the growing concern with cognitive overload – which Wallace (2003b) suggests can occur when too much information is presented in certain situations, leaving the driver with insufficient time to process the available information and make time-critical decisions. Such decisions, which may involve maneuvering for exits, merges, or lane drops, also include what Crundall, et al. (2005) have called "transient hazards" such as a

pedestrian or bicyclist suddenly entering the road, or a vehicle failing to yield the right of way. Wallace believes that visual clutter, which contributes to cognitive overload, is growing worse, with an increasing number of billboards, on-premise signs, and, as well, official highway signs.

Of course it has long been known that official signs can distract drivers and add to their cognitive workload if they are poorly designed, improperly located, unnecessary, redundant, or irrelevant. This can be a particular problem with official changeable message signs (CMS), which are often reported to cause drivers to slow to read their message if too much information is conveyed or undue attention is drawn to the sign. Despite the fact that official signs (including CMS) have benefited from decades of human factors research to ensure that their design and operation is optimized for the driver's needs, distraction remains a concern, and to an increasing extent with the growth of CMS installations.

Wallace, and others, believe that driver distraction, as much of a concern as it is, is likely underreported. This may be because, he suggests, the distraction may be unconscious, or because social and legal pressures may contribute to a driver's unwillingness to admit distraction for fear of consequences such as increased insurance rates, penalty points on their driver's license, or being found responsible for an accident. For these reasons, Wallace believes that it will be difficult to find empirical evidence for the contribution of distraction by a roadside billboard to an accident. Although this is a key reason to question the use of accident data to assess the relationship between DBBs and crashes, there are many others, discussed later in the report by Speirs and her colleagues, and elsewhere in the current report.

The report next discusses the range of planning policy and guidance regarding roadside advertising in the UK. Although of relatively minor relevance to regulations and guidance in the U.S. because of the highly localized nature of such guidance in the UK, we do find that many of the same principles have been applied. For example, roadside advertising signs may be discouraged at locations such as: complex road sections, intersections, pedestrian crossings, or locations where the cognitive demands on the driver may be high. In addition, a Circular (DCLG, 2007) that provides guidance on the control of advertisements suggests that outdoor advertising signs that may pose a danger to the public include those which:

> because of their size or siting, would obstruct or confuse a road-user's view, or reduce the clarity or effectiveness of a traffic sign or signal, or would be likely to distract road users because of their unusual nature (and) (t)hose illuminated signs (incorporating either flashing or static lights) which, because of their size or brightness, could result in glare and dazzle, or distract road users, particularly in misty or wet weather.

The Circular is apparently based, in part, on findings from a study conducted by the Privilege Insurance Company, which found that 83% of drivers responding to a survey had admitted being distracted by roadside advertisements, with 23% of those reporting

that they had veered out of their lane as a result of the distraction. (Privilege Insurance, 2005).

Numerous other regulatory and guidance documents are cited in this section of the report. Although many of these make reference to traffic safety concerns, none of them provide objective definitions of key terms sufficient for regulators to act to control roadside billboards. One such document, for example, requires that local planning authorities must "consider such matters as the likely behaviour of drivers of vehicles who will see the advertisement" and states that "the vital consideration … is whether the advertisement itself, or the exact location proposed for its display, is likely to be so distracting, or so confusing, that it creates a hazard to, or endangers, people in the vicinity who are taking reasonable care for their own and others' safety" (PPG, 1992).

In line with the discussion above, it is useful to note that one of the documents cited in this section of the report deals exclusively with official signs, and provides guidance to roadway authorities on the proper use of such signs throughout the UK (DfT, 2003). This document, known as the Traffic Signs Manual, explicitly recognizes that official traffic control devices (TCDs) can also serve to distract drivers if they are used inappropriately or to excess. Among other guidance, the manual suggests that information signs should not be permitted in construction zones, and that roadway authorities should ensure that signs are limited to those that are considered necessary, because such signs can cause overload and lead to distraction.

Speirs and her colleagues reviewed the decisions of The Planning Inspectorate in 11 cases. Although their summary and discussion of these decisions makes for interesting reading, there is little consistency from one decision to another, and the diversity of issues on which decisions were based (size, illumination, viewing time and change cycle, content, and location, among others) provides little basis to extract principles that might be applicable in the United States. Of the 11 cases cited, however, one billboard was allowed, two were allowed with certain restrictions, and eight were disallowed.

The authors' efforts to review accident data to determine the presence or absence of a relationship between billboard locations and accident occurrences proved to be largely fruitless, for reasons discussed elsewhere in the present report. Some of the key arguments against the use of accident data cited by Speirs and her colleagues are:

- There could be other unknown variables that could have led to the reported accidents.
- There are many opportunities for error or omission in data entry in police accident reporting forms.
- In minor accidents, the involved vehicles may move away from the POR to clear traffic lanes, thus further degrading the potential accuracy of identifying the true location.

- The point of rest (POR) of the involved vehicle(s) (which is what is commonly identified in police reports) may have little relationship to the point of distraction that was the proximal cause of the crash.[3]
- Accidents, particularly minor accidents, are underreported.
- Accident data considers only those incidents that result in an actual collision. But there are likely many more incidences of distraction that result in driver error (such as late braking, lane exceedances) without consequence, and others that result in "near misses" that might have resulted in a crash but for the evasive actions of another driver. "As no data on 'near misses" is available, it is not possible to quantify the full effect of distraction" (p. 35).

For these reasons, and others, the authors recommend against the future use of accident data "as an area for further research due to these practical and statistical issues that would cast doubt over any apparent relationship…" (p. 35).

The authors briefly discuss the potential for the use of CCTV data recorded from fixed locations along the highway network in close proximity to roadside advertising signs. This data, it is suggested, would allow the observation of vehicle braking movements, lane deviations, and other losses of vehicle control, although there is no way to know, from such recordings, whether other causes of distraction were present as contributors. They suggest that, in order for this methodology to be feasible, it would be necessary to collect data along road sections both with and without the presence of roadside advertisements.[4]

The authors conducted interviews with representatives of various stakeholders. These organization types included, but were not limited to, the following:

- Road User Groups, e.g. Automobile Association, RAC Foundation
- Road Safety Groups, e.g. Parliamentary Advisory Council for Transport Safety (PACTS), Royal Society for the Prevention of Accidents (RoSPA)

---

[3] This weakness in the use of accident statistics should not be ignored. Unless an accident involves major property damage, serious injury or death, police in the US will rarely endeavor to find the "root cause," which would include the point at which an involved driver first lost control and/or was first distracted. The vehicle of a driver who crashes as a result of distraction by a roadside billboard may not come to rest for a considerable distance after the distraction occurs, but it is the point of rest that is most likely to be (erroneously) identified in the Traffic Collision Report as the actual accident location. The use of such information will lead to an artificial reduction in any correlation since it captures an accident data point and associates it with a road location that is not coincident with a billboard. As pointed out in the study by Klauer, et al. (2006b), discussed earlier in this Section, accidents may be underreported by 80% or more.

[4] We have suggested, in other contexts, the potential for the use of roadway CCTV data in billboard distraction studies because of the growing number of CCTV locations coupled with the potential for cooperation from DBB owners, through which signs might be turned on and off, and their displays varied in the key parameters of brightness and message display interval in accordance with a carefully developed experimental design. Specific recommendations along these lines were made to researchers in the City of San Antonio, Texas, which has a comprehensive system of CCTV cameras as part of its traffic monitoring network, and which is engaged in a project to monitor the safety impacts of recently erected DBBs.

- Local Authorities, e.g. Local Authority Road Safety Officer Association (LARSOA)
- Planning Officers, e.g. London Borough of Wandsworth (LBW)
- Central Government Departments, e.g. the Department for Transport (DfT)
- Highways Agency
- Amenity Groups, e.g. Campaign to Protect Rural England (CPRE)
- Advertising Industry, e.g. Outdoor Advertising Association, Outdoor Advertising Council, Advertising Standards Authority
- Research Community, e.g. Brunel University
- Motorway Operators, e.g. Midland Expressway Ltd.

Summarizing the results of these many discussions, the authors identified the following broad conclusions:

- Although it is accepted that drivers are responsible for attending to the driving task, "visual clutter is liable to overload or distract drivers" (p. 63).
- The stakeholders could not provide statistical evidence to demonstrate the presence or absence of a correlation between roadside advertising and accidents.
- There is no desire for an outright ban on roadside advertising, but there is general agreement about the need for more guidance or regulation to control the type, location and content of such advertising.
- There is a need for additional governmental powers to remove unauthorized advertising, and there is a need to make enforcement a greater priority.

The focus group discussions provided much information of relevance, summarized below. Three groups were assembled, each including a balance of males and females, and a mix of urban and rural residents. The first group included young, less experienced drivers (ages 17-25) with little motorway driving experience; the second included experienced drivers aged 50 and above who did not regularly use the motorway; and the third included regular motorway users (100 or more miles per week) aged 35-55. Each group included eight participants who were told that the sessions were to discuss sources of driver distraction, without initial mention of a specific focus on outdoor advertising.

Relevant examples of the key points made during the focus group sessions include:

- The younger drivers found motorway driving boring, and felt quite relaxed.
- The older drivers, despite much greater exposure to motorway driving, found it to be stressful and sometimes dangerous, primarily because other drivers take too many risks.
- When asked how long they thought they took their eyes off the road to look at the surrounding environment, the young drivers estimated "several seconds," although they also agreed that this was probably longer than they should.
- When asked what they would consider "too long" a period to take their eyes off the road, the regular motorway users replied "1-2 seconds."

- Several members of the younger driver group described situations in which they had been distracted by something external to the vehicle while driving on the motorway and found their vehicle moving out of its lane and/or having to brake suddenly.
- Some participants in each of the other groups also reported having made driving errors while distracted by something either inside or outside the vehicle.
- One regular motorway user reported several occasions in which he had a near miss as a result of looking away for "too long."

After the initial discussions, highlighted above, the focus group facilitators directed the discussions toward roadside advertisements, and showed photographs of particular installations. Highlights of the discussions that followed are presented below:

- Regular motorway users felt that it was not appropriate to have certain types of advertisements close to the roadway, given the prevailing speed of traffic.
- These users felt that outdoor advertising could pose a distraction to younger, less experienced drivers, although not to themselves.
- Younger drivers, on the other hand, felt that, although outdoor advertising could potentially cause a crash, their effect was no greater than other sources of driver distraction.
- Most of the participants agreed that they did notice and look at roadside advertisements.
- Most of the regular motorway users stated that they tended to look at advertisements when they were waiting in a traffic queue, but confirmed that they read these advertisements even in free-flowing traffic conditions.
- One regular motorway driver felt that it took 2-3 seconds to read an advertisement, but some of the younger drivers felt that ads could be absorbed more quickly (in a "split second").
- Although drivers agreed that they tended to look at every advertisement, they could rarely recall the specifics.
- Drivers in all three groups believed that the decision to look at a roadside advertisement was not made consciously.
- Younger drivers expressed the view that it was inappropriate to have advertisements within a driver's line of sight when he should be paying attention to traffic.
- Most participants across all groups agreed that the potential for distraction from an advertisement was dependent on its size, content, location, and type of display. In addition, bright colors, and "sexual undertones" were thought to attract more attention.
- Younger drivers in particular said that they spent longer looking at advertisements for products or services in which they were interested, or if the advertisement featured something that was new or unusual.

- Younger drivers commented that advertising campaigns which told a story that extended over a period of time or a series of billboards attracted more attention.[5]
- Regular motorway users were concerned that advertisements with a lot of detail posed more of a risk because it was more difficult and time consuming for drivers to absorb all of their content; specific questions were raised about the wisdom of including details such as telephone numbers.
- Electronic billboards were considered more of a potential distraction than fixed displays. Younger drivers, in particular, stated that they looked out specifically for these displays and that they waited for the subsequent advertisement in the cycle to appear.
- One participant in the older group expressed a view that was representative of his group: "When they're about to change, you want to see what they are changing to. It's strange… you might not be interested in the adverts, but when things are changing, you watch it… and they'll distract you... But if it's fixed, and you can see that from half a mile away…, I'm not going to be that distracted by it. It's not drawing my attention because I can see from a distance what it is" (p. 80).
- Regular motorway users felt that an important issue was clutter, caused by a proliferation of roadside advertisements in close proximity. They believed that such a situation, especially when combined with a lot of information from road signs, can cause information overload and result in confusion.
- Younger drivers in particular, but with the agreement of those in other groups, felt that internal distractions (such as mobile phones, navigation systems, maps, or adjusting vehicle controls) were, overall, more distracting than roadside advertisements.
- Younger drivers expressed the view that it is the driver's responsibility to pay attention while driving.
- Participants in all three groups agreed that "few drivers would ever admit to being distracted by an advert and therefore felt that any such incidents are likely to be under-reported" (p. 84).
- The commonly held view was that roadside advertising is not necessary, and should not be seen to be part of the motorway network. (Interestingly, the older drivers tended to believe that roadside advertising provided a source of revenue to the government and that revenues raised should be directed toward highway improvement).
- "Overall, it was felt that roadside advertising might well be distracting to some drivers, but not personally to those who participated in the focus groups" (p. 85).
- With regard to the imposition of control or regulation, regular motorway users suggested that the amount of detail in an advertisement is of concern, and suggested imposing a limit on the number of words allowed; a limit of 4-6 was deemed appropriate.

---

[5] This is the issue of "sequential" advertisements discussed elsewhere in the present report; the phenomenon that describes how one's interest is held during such a sequence is known as the Zeigarnik effect, discussed in Section .

- Similarly, older drivers and regular motorway users expressed the greatest concern about electronic advertisements, and felt that it was inappropriate to permit this kind of advertisement on the highway network.
- Regular motorway users as well as older drivers believed that roadside advertisements should be located only within the view of queued traffic, and not in the vicinity of free-flowing traffic.
- There was support for regulation on the spacing of advertisements, in terms of a minimum distance between advertising signs, as well as a minimum distance away from highway signs so that "they do not detract from the information which is provided for the driver's safety" (p. 87).
- Participants in the older driver group felt that roadside advertising should not be permitted on the motorway unless it provides directions or information of use to the driver; in addition the presence of advertising along motorway sections that require concentration by drivers was seen to be at odds with road safety.
- Some females called for the removal of all roadside advertising; others accepted that it was unlikely that all could be removed, but supported greater regulation of advertising signs in general, including brightness, spacing, and content. Electronic billboards were singled out as a key concern due to their ability to distract (p. 88-9).
- Regular motorway users felt that the driving environment would be safer without advertisements, but believed that simple ads that could be quickly absorbed, when placed along uncluttered roads, did not pose a safety issue.

In addition to the three concentrated focus groups, the authors conducted an on-line survey, hosted on the HA website. The survey was designed to examine respondents' views on potential sources of in-vehicle and external-to-vehicle distraction, followed by a more specific focus on roadside advertising. Because of a large sample size (1371 responses) the authors were able to report a sampling error of only +/- 2.65% at the 95% confidence level. In other words, if 50% of the survey respondents gave the same answer to a question, the authors could be 95% confident that, if the survey had been conducted with the entire population, the responses to that question would fall within the range of 47.3% and 52.7%. This degree of accuracy is even greater when a larger or smaller percentage of the respondents has given a particular response, but 50% is used as a benchmark because it has the greatest sampling error.

Demographically, the respondents tended to be male, and between the ages of 25 and 59. They drove between 10,000 and 25,000 miles per year, and used the motorway more than five times per week.

At the outset of the survey, respondents were given a list of 14 possible sources of distraction (both within and outside the vehicle) and asked to select those which they considered to be most distracting. The top five identified sources, and the percentages of respondents who provided those answers were: Rubbernecking at accidents (75%), child passengers in their vehicle (68%), hands-free mobile phone use (67%), roadside billboards 61%), and roadwork (50%). When asked about the single greatest source of

distraction, 24% said mobile phones, 18% reported other passengers, 13% said rubbernecking at accidents, and 9% selected roadside billboards. No other distracters were considered the most important by more than 5% of the respondents (in-car navigation systems and actions by other vehicles).

Once the topic of outdoor advertising was introduced, a series of questions sought to examine whether some types of roadside advertising were considered to be more distracting than others. Participants were asked to select the types of advertising, if any, that they had found to be personally distracting while driving, and then to identify the single most distracting type of roadside advertising. The results are shown below:

- Billboards with changing images (DBBs) were reported to have distracted 72% of all respondents; 53% of the respondents found DBBs most distracting.

- Conventional billboards had distracted 61% of the respondents, and 17% found these to be the most distracting.

- Advertisements on vehicles had distracted 38% of respondents, but only 3% found these to be the most distracting.

- Advertisements on bus shelters had distracted 24% of the respondents; 9% found these to be the most distracting.

Seven percent of the respondents found none of the advertising types to be distracting, and 11% mentioned other types of advertisements (such as ads on street furniture, on-premise signs, and small temporary roadside signs) as having been a source of distraction to them.

Roadside advertising characteristics that contributed to distraction were: location (59%), size (49%), content (39%), changing images (29%), color and information provided (25% each), and lighting (16%).

Respondents were given the opportunity to include narrative statements to highlight their answers. The authors summarized these statements, and reported more than twice as many comments expressing concerns about DBBs (9) than for any other aspect of roadside advertising – content (3), location (4), and size (1). Representative quotes about DBBs included:

> "Changing signs draw attention to themselves; they are not part of the traffic and amount to a serious distraction. I cannot understand why they are allowed!"
>
> "Those with images that change over a period of time tend to attract a longer spell of attention whilst waiting for the next image. If one's vehicle is actually moving at the time this has the effect of driving blind while watching the particular sign."

"You can look quickly at a static board and take in a fair amount of information, however, if you know the image will change you are tempted to keep looking until it does which means taking your eyes off the road for longer."

"A quick glance is enough to know it is an image changing billboard but then the temptation is to keep looking to see what it changes to" (p. 102).

Respondents were next asked to rate the extent of distraction that they believed was due to different aspects of the "content" of roadside advertisements. Ratings were to be made on a five-point Likkert-type scale from 1 ("not at all distracting") to 5 ("very distracting"). Advertisements with changing images were rated by 56% of the respondents as very distracting. Those with complex graphic images were rated very distracting by 42% of the respondents, ads with small text by 28%, ads with lots of details (e.g. telephone numbers) by 26%, and those with more than 10 words by 20%. Of equal interest to Speirs and her colleagues was the difference between those who found each type of content distracting or very distracting, compared to those who rated the same type of contact as "not distracting" or "nor at all distracting." This difference was largest for DBBs; 79% found such signs distracting or very distracting, whereas only 8% found them to be not or not at all distracting – a difference of 71%. The equivalent differences were 67% for signs with complex images, 32% for those with small text, 31% for signs with more than 10 words, and 27% for ads with lots of details.

In order to evaluate the effects, if any, of roadside billboards on general driver performance, a series of statements were presented to the participants, who were asked to state whether they thought each statement was true or false. The statements, and the levels of truth assigned to them, were as follows:

- Can be confusing in urban environments (83%)
- Can be detrimental to overall driving performance (82%)
- Electronic ads with changing images are more distracting than static ads (82%)
- Is an unwelcome distraction to the driver (75%)
- A driver may steer slightly out of lane to read a roadside ad (58%)
- A driver may brake to read a roadside ad (53%)
- Keeps drivers alert (14%)
- Is not distracting in rural environments (12%)
- Is not distracting in urban environments (11%)
- Improves a driver's concentration (4%)

When asked whether their own driving performance had been adversely affected by roadside advertising signs, 17% (201 respondents) said that their performance had definitely been affected, 29% felt that it had probably been affected, 34% stated that it had possibly been affected, and 20% believed that it had not been affected.

For those 913 respondents who stated that their driving performance had been affected by roadside advertising, they were presented with a series of seven statements and asked to

indicate whether they felt each was true or false. The statements, and the level of truth assigned to them, were as follows:

- Distracted my visual attention whilst driving (96%)
- Occasionally been detrimental to my driving performance (72%)
- Affected my speed whilst driving (42%)
- Affected my steering whilst driving (33%)
- Made me more alert whilst driving (7%)
- Have, at times, made me a better driver (5%)
- Have never impacted upon my driving performance (4%)

In summarizing the survey, Speirs et al expressed surprise at the dominance of the reported views that roadside advertising has a negative impact on driver performance; prior to conducting the survey, they expected to find highly polarized opinions. Their key findings were described as: 80% (926 individuals) admitted that their own performance is likely to have been affected by roadside advertisements; 76% of all respondents (878 individuals) admitted that they took their eyes off the road to read such advertisements; and 30% (347 respondents) had deliberately slowed down to look at advertisements. In particular, "electronic/digital billboards with a series of rotating images are considered to be particularly distracting" (p. 115).

In short, the authors conclude that this survey, with its large sample size and resultant small sampling error, suggests that there is cause for concern when the responses of the study participants are projected to the UK population at large.

We have spent considerable time discussing this report, in part because it is so comprehensive and current, and in part because it is the first study of which we are aware that has engaged in large scale sampling of the public's views of roadside advertising, including DBBs, and, specifically, the public's perception of how such outdoor advertisements have adversely affected their own driving behavior. It will be recalled that one reason why accident data is thought to be of relatively little value in studies of driver distraction is that it is widely accepted that, for several reasons, drivers will be reluctant to admit their own distraction when it is connected to possible crash involvement. In this survey, on the other hand, where responses were anonymous and there was no risk to the respondent, the answers can be considered to be more objective and truthful.

Among their principal conclusions, Speirs and her colleagues suggest that current guidance and policy is insufficiently detailed to address the different types and characteristics of outdoor advertising devices, particularly DBBs. As a result, further research is needed to quantify the level and significance of the risk. They believe that post-hoc accident studies would not be useful to pursue unless the researchers had direct access to the involved drivers in near-real time. They point to the most recent research studies that they reviewed, those by Young and Mahfoud (2007) and Clark and Davies (2007) as producing "statistically significant results which suggest that the level of distraction caused by advertising does present a genuine road safety concern" (p. 117). These studies, however, have been criticized by some stakeholders as being "unrealistic"

in that they were simulator based and thus their applicability to the real world may be compromised. Nonetheless, the authors recommend that further research build on Young and Mahfoud's work "to explore and quantify the effect of different characteristics of advertisements on levels of driver distraction" (p. 122). They argue that a future study, if properly funded and conducted on an advanced driving simulator, should be able to overcome some of the limitations of this earlier work – small sample size, limited number of variables, stimulus material not fully representative of actual billboards, and a simulator of somewhat limited flexibility and fidelity. The authors review three UK-based driving simulators, and recommend that future work be undertaken at the University of Leeds Driving Simulator (UoLDS). In their discussion of the strengths and weakness of a driving simulator study, the authors argue that simulators permit the different types and sizes of billboards of interest to be studied to examine the effects on drivers, a task that would be more complex in a test track or on-road study. Finally, the authors present a suggested approach for the conduct of a driving simulator study.

Although it is beyond the scope of the current project to recommend future research (the reader is referred to the recently published FHWA report [Molino, et al. 2009] for this discussion), we respectfully disagree with recommendations put forth by Speirs and her colleagues. It is our opinion that, when studying critical issues of roadside billboards, particularly DBBs, that even today's most sophisticated simulators are incapable of rendering the key characteristics of such signs at a level of visual fidelity sufficient to lead to findings that can be generalized to the field with confidence. This is because the levels of brightness of which today's DBBs are capable exceed the capacity of the display systems used in simulators. Thus, because DBB brightness has been hypothesized to be a key contributor to possible driver distraction, this is of concern. A second concern, one that is touched on by Speirs, et al., is that of the naturalistic aspects of the driving task encountered by participants in the experiment. For several reasons, including visual fatigue and the risk of simulator sickness, experimenters tend to keep scenarios relatively brief. In order to expose the participants to a reasonable number of experimental variables (in this case, variants of DBB displays), it then becomes necessary to incorporate an unusually large number of such variables into these brief scenarios. But, because the impacts of DBBs on driver distraction, if they exist, are likely to be highly context sensitive, the inclusion of several such signs into relatively brief scenarios is likely to create an unrealistic visual environment which may lead to driver responses that are not representative of those that might occur in the real world. It is this author's opinion that initial studies, if funded, should be done in the field, with carefully selected and controlled sites in which before and after comparisons can be made, and in which matched roadway sections with and without DBBs may be studied. If differences in distraction are found, we believe that it would then be appropriate to move to a driving simulator to study the impact on driver performance of different levels of display cycle times, sign size, proximity and angle to the traveled way, etc.).

Dudek, C., 2008

Dudek (2008) reviewed the state-of-the-practice for the use of official, permanently mounted changeable message signs (CMSs) during "non-incident, non-

roadwork" periods. Practices relating to the display of AMBER (America's Missing: Broadcast Emergency Response) alert messages were included, The report was based on a review of the literature and a survey of State DOT traffic management centers (TMCs) and agencies that operate toll roads. Overall, responses were received from 40 States and six toll road agencies with a total of 100 TMCs operating 3,023 urban and 821 rural CMSs.

In principle, the study of practices regarding official CMSs is somewhat removed from a review of commercial DBBs; yet there are important areas of overlap between the two uses of this technology that bears discussion.

Dudek describes the primary applications for CMSs as serving to notify motorists of:

- Non-recurrent problems caused by random, unpredictable incidents such as crashes, stalls, or spills; and temporary, preplanned activities such as construction or maintenance.
- Environmental issues such as fog, floods, snow, or ice.
- Traffic problems caused by special events, such as parades or sports events.
- Special roadway operations such as reversible, high occupancy, or contraflow lanes; or certain design features such as drawbridges.
- AMBER alerts.

His review was undertaken because, although guidelines are available for the design and operation of CMSs when used for their principal purposes, there are no guidelines available, and little understanding of existing practice, for the use of these signs under non-incident, non-roadwork conditions. The primary purpose of this synthesis of practice was to identify those practices that have proven effective and ineffective, and to serve as a guide to State and other operating agencies in the more effective use of their CMSs, as a first step toward the possible development of guidelines for such uses.

Guidelines for the design and operation of CMS were initially developed in 1978, and have been refined several times over the past 30 years. Because CMSs are part of the official highway information system, they must communicate a meaningful message that can be quickly read and understood by drivers. It is well understood that the design of effective messages requires the application of proven principles for each of the following display features:

- Message content
- Message length
- Message load; units of information
- Message format
- Message splitting

Although traditionally left blank when not in use for their intended purpose, there has been an increase in the use of these signs by transportation agencies over the past 10 years to display messages when the signs are not otherwise needed. Such messages have

been predominantly those that indicate travel time, and these are recommended by FHWA. However, other, non-essential messages have seen growing use, including information about congestion, speed, traffic ordinances, safety campaigns, and public service announcements (PSAs).

Examples cited of safety campaign messages included (dashes indicate line breaks):

- CLICK IT – OR TICKET
- BUCKLE UP FOR – SAFETY – IT'S THE LAW
- U DRINK – U DRIVE – U LOSE

Examples cited of PSAs included (ellipses indicate more to the message than shown):

- REPORT DWI …
- AIR QUALITY ALERT …
- BLOOD DRIVE …
- BURN BAN IN EFFECT …

The rationale for leaving CMSs blank when not in use for their primary purpose is that, when essential information is presented on the sign, it will be more attention-getting, drivers will be more likely to notice it, and the message will be more effective. The question always raised about this traditional practice, however, has been whether drivers will question the sign's functionality. In addition, Dudek found that some agencies experienced negative public opinion from those who felt that the expensive investment in this technology was being underutilized.

Dudek notes (p. 3) that the FHWA discourages the display of PSAs on these signs. Two important concerns about this use of CMSs have been that the signs lose credibility with motorists when used for other than their intended purposes, and the risk of "change blindness," the potential that a motorist will fail to see that the message on the CMS has changed from something that is non-essential to something that is highly relevant and, perhaps, time critical.

The author cites the experience of Caltrans, which posted transportation-oriented PSAs (e.g. "RELIEVE CONGESTION-RIDESHARE") on CMSs in the Los Angeles area so as to avoid leaving the signs blank. Public reaction was "quite negative" (p. 15), and the agency's traffic operations personnel believed that using the signs to display messages that were irrelevant to freeway operations led the public to disregard the signs, thus reducing their effectiveness when they were most needed.

The display of safety messages on CMSs falls into a middle ground – not discouraged by FHWA, but allowable under specific circumstances. If used, agency respondents say, such messages should be current, and displayed for only a limited time.

One unfortunate consequence reported by agencies that displayed safety messages and/or PSAs was that these practices led to a proliferation of requests from other agencies and organizations to display their own non-traffic-related messages.

Although the present study addresses commercial advertising signs, specifically DBBs located off the right-of-way, there are lessons to be learned and applied from Dudek's review of official CMSs located within the right-of-way. He says:

> If CMSs distract drivers from more critical tasks while traveling at prevailing speeds, or if the messages are erroneous or outdated, then driver acceptance can be compromised. In addition, if the messages are too long, complex, and/or confusing to read and comprehend, drivers may reduce speed to read the messages and this could result in a potential safety problem (p. 3).

While all of these concerns have relevance to the design and operation of DBBs, they convey a special precaution for the potential future use of official CMSs for the display of commercial advertising messages when not in use for the primary purposes (see Section 7 of this report for a fuller discussion of this issue). If transportation agencies have reported to Dudek that the use of CMSs for the display of safety campaigns and public service messages can have negative safety consequences in terms of change blindness or CMS credibility, and if FHWA discourages the use of CMSs for the display of PSAs, one must question the reasonableness of the current consideration being given for the use of these signs to display commercial advertising.

Dudek asked his respondents about their experiences with public reaction to leaving CMSs blank when not in use for their principal purpose. Thirty-nine percent of the TMCs responding received "somewhat" to "very" favorable responses from the public; twenty-four percent received a neutral response, and none received unfavorable responses. (Thirty-seven percent had insufficient information). Favorable comments about their experiences included (p.17-18):

- Drivers pay more attention when a message is displayed, messages are more effective when displayed, frequent display of non-essential messages results in drivers ignoring important messages (15 respondents)
- The conspicuity and message urgency of the CMS is preserved (1 response)
- Credibility of the message is the key to success (1 response)
- Relevant, timely information enhances driver respect (1 response)
- Displaying messages unrelated to motorist's travel could increase disregard for the CMS when messages are relevant (1 response)

He also asked about experiences with safety campaign messages on CMSs. Twenty-nine percent of the reporting TMCs received "somewhat" to "very" favorable responses from the public; eighteen percent received a neutral response, and two percent received unfavorable responses. (Fifty-one percent had insufficient information). Comments about their experiences included (p.34-35):

- Messages should be displayed for a short time, and not often (18 responses)
- We get negative feedback from the public (8 responses)
- They should be displayed only for well-organized statewide safety campaigns (7 responses)
- The public is generally receptive to the messages (6 responses)
- They open the door to other requests that are not transportation related, and denying such requests is a problem (6 responses)
- Messages should be kept simple and easy to understand (4 responses)
- Post such messages only off-peak (or in the off-peak direction) to minimize unintended congestion (2 responses).
- Display only safety-related or agency-supported messages (2 responses)
- Make sure message is not distracting to motorists (2 responses)
- Make sure there is value in the message to the public (1 response)
- We receive and deny requests for advertising messages (1 response)
- Message must have broad public impact (1 response)

One expressed concern, for both safety campaign messages and PSAs, was that the decision to display such messages was overwhelmingly due to administrative/upper management requests (93% in the case of PSAs, 99% for safety campaign messages), occasionally against the judgment of operations personnel, and with little or no support from research.

With regard to AMBER alert messages, Dudek reports (p. 41) that 84% of those TMCs that display such messages exceed the maximum recommended (four) units of information on a CMS. As a result, "the majority of motorists will not be able to read and comprehend the messages while traveling at typical freeway speeds" (p. 41-42), and "those drivers who attempt to read the messages before passing the CMS may reduce speed" (p. 40). This is simply because the type of information typically displayed on a CMS-based AMBER alert message may include a license plate number (equivalent to more than three units of information) and a 10-digit telephone number (equivalent to more than three units of information). He cites two previous studies (Ullman, et al. [2005] and Dudek, et al. [2007]) that found the average reading times for AMBER alert messages containing a license plate number or a 10-digit telephone number were significantly longer than the reading times for signs without this information.

There are several lessons to be learned from this study that have direct relevance to DBBs. Long messages containing information such as telephone numbers take longer to read and may cause drivers to slow in an effort to read the message. The amount of information on signs should be strictly limited to minimize its distraction potential. Even official traffic signs can overload drivers. In addition, there are specific lessons that can inform projects currently being considered that would allow commercial advertising to be displayed on official CMSs within the right-of-way. Messages that are irrelevant to traffic safety or flow that are broadcast on official CMSs are strongly opposed by motorists, and the decisions to accept such messages (including safety campaign messages and PSAs) are generally imposed by senior administrators or managers regardless of the concerns of operations personnel. There is concern about change blindness – that motorists will not

notice a sign whose message has changed from something irrelevant to something of importance to them. And there is considerable concern about the loss of credibility of official CMSs when they display messages that the public believes are not timely and not related to traffic safety and flow.

Edquist, J., 2009a, 2009b

For her recent doctoral dissertation, Edquist (2009b) performed a study using a high fidelity driving simulator to assess the effect on driver response to road signs and to vehicles ahead of them when in the presence of ambient visual environments that represented different degrees of clutter. Edquist describes three types of clutter that are present to different degrees in different driving settings. *Built clutter* is clutter caused by the complexity of the man-made environment – buildings, wires, bridges, storefronts, billboards, utility poles, etc.); *designed clutter* is clutter created by road authorities through the number, size, placement, and diversity of traffic control devices (signs, signals and markings); and *situational clutter* is caused by the number and mix of vehicles in the traffic stream, the number of lanes of travel, weather, etc. While holding situational clutter constant in the simulator, Edquist varied the extent of built and designed clutter, and measured the changes in the participants' responses to traffic control devices and to the behaviors of vehicles in the traffic stream. Four types of vehicle changes were presented: the car directly in front of the participant moved closer or farther away, and vehicles in adjacent lanes appeared or disappeared from view. She found that high levels of designed clutter slowed the participants' detection of changes to official signs. In other words, it was more difficult and time consuming to identify and respond to the relevant traffic control device when there were many such TCDs competing for the driver's attention. Conversely, she found that high levels of built (environmental) clutter delayed the participant-driver's detection of changes in both signs and other vehicles. Because the changes to these other vehicles were highly visible, relevant to the participants' driving task, and "not minor" Edquist found that the adverse impact caused by additional built clutter to be of concern.

Edquist summarized the literature about older drivers that showed that this cohort has difficulty with divided attention and rapid task switching both of which are important for safe driving. These concerns are exacerbated under conditions of high workload. In comparing older to young, novice drivers (those with probationary licenses), she found that in the presence of high visual clutter the older drivers had more difficulty both finding and responding to official road signs, and in detecting changes to nearby vehicles in the traffic stream. The novice drivers did not experience these difficulties to the same extent.

In a simulator-based driving study performed to try to confirm or refute an earlier study using still photographs, Edquist found that, when billboards were present, participants drove more slowly, took longer to change lanes in response to direction to do so by road signs, made more errors when changing lanes, and spent more time looking at the roadside and less at the road ahead of them. Older drivers in particular made more errors when changing lanes when billboards were present. The author notes that, due to

limitations in the simulator platform, her scenarios depicted relatively low complexity environments. In addition, there was not enough traffic in the simulated road scenes to create elevated levels of driver workload, and the billboards depicted were simpler than those typically found on actual roads. Thus, she concludes, her experiment likely underestimated the adverse effects of billboards on driver response to traffic conditions. The author notes that there are often questions about the extent to which simulator results can be generalized to the real world; however, in this case, since both the visual and cognitive workloads in the simulator were lower than they would be in the real world, she believes that the real effects of these distracters are probably larger than what she observed. Edquist summarizes her study by stating that visual clutter adversely affects where drivers look, what they see and how quickly they see it, and negatively impacts their driving performance in terms of speed maintenance and response to traffic signs.

Fisher, D., 2009

Fisher (2009) reported on work conducted in his laboratory regarding the effects of external distractions on novice drivers. Using their high fidelity driving simulator, Fisher and his colleagues measured glance durations to such distracters, vehicle behaviors, attention to the forward roadway, and attractiveness of the distractors.

When comparing the maximum glance duration toward the distracter (the simulated billboard or the in-vehicle infotainment device) for older and younger drivers, Fisher found that younger drivers were considerably worse (i.e. a larger percentage of them took long glances toward the distracter) than older drivers. However, when the distracter took the form of an external distracter (the billboard), the performance of both younger and older drivers deteriorated. Specifically, using the two second target value identified in the 100- car study, Fisher found the following:

Percentage of Drivers Making Glances Longer Than 2.0 Seconds to:	Older Drivers	Younger Drivers
Distracters Inside the Vehicle (Infotainment Devices)	22%	55%
Distracters External to the Vehicle (Billboards)	80%	80%

In analyzing the longest glances toward the distraction source, Fisher found the following:

Percentage of Drivers Making Glances Longer Than 5.0 Seconds to:	Older Drivers	Younger Drivers
Distracters Inside the Vehicle (Infotainment Devices)	4%	11%
Distracters External to the Vehicle (Billboards)	17%	27%

These findings suggests, of course, that older drivers are less likely to be distracted by inside the vehicle sources than are younger drivers, but, when the distracter is a billboard, older drivers are just as likely to be distracted as younger drivers, and the percentage of drivers who engage in excessively long glances to such billboards is substantially higher for external than for inside-the-vehicle distracters. Fisher hypothesizes that drivers

looking inside their vehicle at a navigation system, entertainment device, etc., are aware that their eyes are off the road, but when the distracter is outside the vehicle, along the roadside, drivers may be able to observe the forward view including traffic in their peripheral vision and therefore believe that they are attentive to the driving task. This will be a subject for future research.

Martens, M., 2009

As part of an effort to develop guidelines for the control of visual distracters adjacent to the roadside for the Dutch Ministry of Transport, Martens and her colleagues at TNO performed a literature review of the human factors principles to be followed. She summarized the key findings of this review as follows:

1. Visual information processing can be of two types –
    a. Central processing in which the object being viewed is fixated, and
    b. Peripheral processing, in which the object is not fixated

2. In order to read the object being viewed, the object must be fixated.

3. Elements such as color, shape, movement, lighting, can be identified without fixations.

4. Attention precedes an eye fixation on an object; first attention is drawn, then the eye follows

5. During saccades (the quick movement of the eye between objects) the eye is "blind"

6. In measuring eye movements and fixations, we can measure the "fixation" but we cannot know with the focus of attention – i.e. what the person is attending to.

7. Part of the driving task (e.g. lane keeping) can be done with peripheral vision.

9. Our attention can be drawn to an object through a "top down" process, i.e. where we have chosen to attend to it because of personal interest ; or via a "bottom up" process, where the object itself attracts our attention via its inherent properties such as brightness, conspicuity, or movement.

10. In driving, "bottom up" distracters should be avoided.

The recommended guidelines that the TNO personnel developed from these core principles are discussed in Section 5 of this report.

Molino, Wachtel, Farbry, Hermosillo & Granda (2009).

This report reviews recent research about the possible effects on driver safety of roadside DBBs. The report updates earlier work, reviews potentially applicable research methods, and recommends an approach to future research. The study examined a range of

DBB-related independent variables that might affect a driver's response to such signs, and a range of dependent variables that might serve as measures of driver distraction or inattention. The potential research methods and the independent and dependent variables were weighted and integrated into a matrix to produce a set of alternative future research approaches. For a proposed initial study, three candidate methodologies were compared: an on-road study using an instrumented vehicle; a naturalistic study; and a study using unobtrusive observation. The on-road study was determined to be the best choice for the proposed initial study.

It should be noted that this project was performed essentially in parallel with the present study. Although both looked at the recent literature that addressed driver behavior and performance in the presence of DBBs, the two studies had different goals and took different approaches. The study by Molino and his colleagues was intended to identify gaps in our current knowledge and design a research strategy to begin to fill those gaps, with the ultimate goal of providing the FHWA Office of Real Estate Services with a sufficient empirical basis from which to develop or revise, if appropriate, guidance and/or regulation for the use of DBBs along the Federal Aid Highway System. These goals differed considerably from the present study, whose purpose was to review, not only the recent research literature, but also existing guidelines and/or regulations that have been developed in the U.S. and abroad to address DBBs. Finally, the ultimate goal of the present study was to take what is known from the research, combine this knowledge with what has worked for regulatory authorities, and recommend new guidelines and/or regulations that could be enacted by State and local governments, and private and toll road authorities, without the need or the ability to wait for the completion of additional research. The FHWA study had no such objective.

SECTION 3.

RESEARCH UNDERTAKEN OR PUBLISHED BY THE OUTDOOR ADVERTISING INDUSTRY

Over a period of many years, the outdoor advertising industry has commissioned a number of research studies from universities and private consulting organizations. To a large extent these studies, their methods and results, are not released to the public. Occasionally, or upon request, the OAAA will release the report of a commissioned study. In addition, internet research occasionally identifies excerpts of such work or information provided by manufacturers or sellers of space on billboards oriented to potential clients. Finally, patent searches occasionally identify new technologies of relevance in the field.

The on-premise sign industry, through its representative organizations such as the International Sign Association (ISA) and the United States Sign Council (USSC), has also sponsored research, some of which is available to the public for a fee through the organizations' web sites. The USSC website currently lists 15 documents available for purchase by the general public. Examples of such studies include those by Garvey, Thompson-Kuhn & Pietrucha, (1995), Garvey (1996), and Kuhn (1999). In addition, the ISA publishes a periodical called *Signline*, which reports on new developments, and often highlights legal challenges to on-premise signage.

Perception Research Services (1983), Young (1984).

A series of studies conducted by Perception Research Services (1983), and separately reported by its President (Young, 1984) was intended to "observe the attention-getting ability of outdoor boards from the perspective of the individual in an automobile (Young, 1984, p. 19). This work measured the eyegaze behavior of 200 licensed drivers who viewed a 27 minute video of a drive through three metropolitan areas to "observe the stopping power of outdoor" (p. 19). Although insufficient detail was presented in the published reports to independently review the research, the results are illuminating. First, the author suggests that recall scores (based on questioning of the participants immediately after the simulated drive) "grossly (understates) the true impact of outdoor advertising ... that outdoor is generating approximately two and one-half times as much attention as recall scores would ever indicate" (Young, p. 20). Second, the research found that "outdoor advertising located near highway signage tends to generate *greater* attention. We hypothesize that the highway signage tends to wake up the driver; his state of alertness increases and his attention to advertising and signage in the immediate area tends to get enhanced" (Young, p. 21). Finally, the research found that outdoor advertising attracts attention regardless of whether the displayed message is of interest/relevance to the driver or not. These findings, and particularly the last, obviously intended for an audience within the billboard industry, provide a useful comparison to the findings of several of the studies discussed in Section 2 of this report. In particular,

Young's finding that billboards attract a driver's attention whether or not the message is of interest or relevance, is quite similar to the findings of Crundall, et al. (1999), and Theeuwes, et al. (1998, 1999), both of whom showed that drivers do not, and cannot, ignore such irrelevant stimulation, even during the performance of a high priority task. Interestingly, Young's findings run directly counter to arguments routinely made by industry representatives in discussions with regulators – that there is no adverse safety consequence of billboards because, when a driver is engaged in a demanding task, he simply ignores the advertisement. An updated version of this report was issued in 2000, but has not been made public.

In addition to Perception Research Services, there are an unknown number of organizations that offer testing and assessment services to the billboard industry, or provide technologies to assist in such testing. Numerous technologies have been developed to perform such analysis, including simulator studies (PreTesting Company, Undated) billboard-mounted eye-tracking devices (Skeen, 2007), and others.

We are aware of only two billboard industry sponsored research studies that have addressed DBBs empirically. These studies have been comprehensively reviewed previously by Wachtel (2007), and the full details of those reviews are not repeated here. The interested reader can examine the full reviews at: http://www.sha.state.md.us/UpdatesForPropertyOwners/oots/outdoorSigns/FINALREPORT10-18-GJA-JW.pdf . Below, we have summarized the concerns that were discussed in the earlier reviews, as well as the comments of other independent peer reviewers. Overall, the reviewers have found serious weaknesses in both studies; weaknesses that call their findings into question. Conversely, in one of the two studies, data was collected but not fully analyzed or reported that should have led the researchers to conclude that there were, indeed, adverse safety consequences of roadside digital advertising signs.

Tantala & Tantala (2007)

This study was performed for the Foundation of Outdoor Advertising Research and Education (FOARE), an arm of the Outdoor Advertising Association of America (OAAA). The authors performed a post-hoc accident analysis study in which they reviewed statistical summaries of traffic collision reports, the originals of which had been prepared by investigating police officers. There are serious, inherent weaknesses in the use of this technique; such weaknesses have been understood and well documented for many years (see, for example, Wachtel and Netherton, 1980; Klauer, et al., 2006b, Speirs, et al., 2008). The use of this approach to relate crashes to driver distraction from DBBs, however, raises additional concerns. These issues are discussed below.

Limitations of Post-Hoc Accident Analysis.

Any post-hoc accident study, in which researchers review statistical summaries of traffic collision reports (TCRs) is limited, not only by the detail and accuracy of the original reports, but also by the inherent simplifications imposed by the coding system used to summarize the data in the first place. When a third party excerpts this summary

data for inclusion in a statistical data base, as is the case here, the level of detail and specificity that may have originally been present is further compromised. When such summary data are used to relate crashes to driver distraction that may or may not have been caused by the location and operation of DBBs, the interpretation of crash data is subject to further limitations, discussed below.

In addition to the general methodological concerns discussed above, there are several other important limitations to the viability of post-hoc accident analyses. These include:

- It has long been known that the majority of traffic collisions are never reported to, nor investigated by, the police. However, it was not until the conduct of the 100-car study (see, for example, Klauer, et al. 2006b) that researchers developed a "real world" understanding of the magnitude of this issue. The study documented 69 crashes that occurred to participants while driving their instrumented cars. Of these, 57, or 83%, were not reported to the police. If this statistic is applicable to the driving population at large in the U.S., then the fact that less than 20% of all crashes are reported to the authorities suggests that post-hoc crash studies are underreporting crashes by a factor of five. We believe that this problem is likely to be exacerbated with distraction accidents, for reasons to be discussed below.

- Unless a reported crash involves major property damage, serious injuries, or fatalities, any police investigation is likely to be cursory. In most States, only a serious crash requires a specialized investigative team to examine the precursors to the accident (evidence such as skid marks, debris fields, etc.) and to prepare a supplemental report. For the vast majority of police investigated accidents, no in-depth investigation is performed.

- As a result of the typical limited investigation, the crash location is generally identified as the point of rest (POR) of the involved vehicle(s) after the impact rather than the upstream location where the driver or drivers initially lost control or failed to pay attention. For a study of driver distraction or inattention, what matters is the location where the inattention or distraction occurred. The POR of the involved vehicle(s) is meaningless. In fact, since the POR may be a considerable distance downstream from the "distraction location," not only will the TCR (and its statistical summary) fail to provide the relevant information needed, but this summary data may lead to an artificial understatement of the relationship between the source of the distraction and the accident, should one exist. This is because more crashes will be coded as having occurred at a roadway location that is not related to the source of the distraction.

- Drivers who are involved in crashes as a result of their inattention or distraction are unlikely to willingly report their pre-crash behavior to an investigating officer (Wallace, 2003b, Speirs, et al. 2008), due to concerns about legal liability, insurance surcharges, or points on a driver's license.

Indeed, the driver may not even be aware of having been distracted or inattentive.

- As a result of a driver's inability or unwillingness to recognize distraction as a potential factor, an investigating officer is likely to check a box on the TCR such as "failure to yield right-of-way," or "following too closely" for expedience.

For these reasons, it is likely that the traffic collision summaries evaluated in this study represent a substantial underreporting of the true total number of crashes that occurred on the road sections studied within the analysis period. Further, it is likely that the classification scheme (using vehicle point of rest as the accident location) artificially reduces any true correlation between DBB distraction and driver errors that result in loss of control, and, at the same time, artificially increases correlations shown to be unrelated to DBBs.

Erroneous Underlying Assumptions.

The roadway sections for which data (accident report summary statistics) were collected for this study rest on two basic underlying assumptions made by the authors. The first assumption rests, in turn, on their determination of the distance from which a DBB could be seen by an approaching driver. The second rests on the researchers' decision to exclude from their data analysis those crashes that resulted from what they called "data bias" or "intersection bias." We believe that these determinations, and the assumptions based upon them, were seriously flawed. Each will be discussed in turn.

Assumptions about the Visibility Distance to DBBs.

The authors, justifiably, intended to analyze those crashes that occurred in the vicinity of DBBs, i.e. those roadway sections in which an approaching driver could first *see*, and subsequently *read* the message on such billboards. In other words, the crashes of interest would be those that were initiated (i.e. where a driver first lost control or first failed to attend to the driving task) during the time and within the road section that a DBB was within the visibility or legibility range of an approaching driver. We would want to compare such crashes to those that occurred on comparable roadway sections where no DBBs were visible or legible.

It is imperative, therefore, that the researchers identify, in advance of data collection, those roadway sections which were, and those which were not, within the visibility and legibility ranges of the seven DBBs that they studied. To support their determination of these locations, the authors provide the reader with five different terms, none of which are clearly defined in the report. These terms are: "visible range from route," "viewer reaction zone," "viewer reaction distance (VRD)," "viewer reaction distance zone", and "viewer reaction time (VRT)." The only one of these terms that is given a definition is this tautological and confusing description of VRD: "... Viewer Reaction Distance (is) how far from a billboard that the driver is potentially within the 'influence' of the

billboard" (p. 45, 79). In other words, viewer reaction distance is the distance in which the viewer can react to the DBB. Instead of providing a meaningful or operational definition of this key term, the authors explain that "reasonable values for VRD were previously determined in previous studies, and are a function of the driver's speed." But no such previous studies are cited, and no other basis for the VRD formula is offered. Regardless of the basis for the determination of VRD, however, the researchers' statement that it is a function of speed is simply wrong. Clearly, the *distance* at which a driver can first see, and then read, any sign (DBBs included) is independent of speed; it is only viewer reaction *time* that would be affected by speed. This is a critical error, because this false assumption led the authors to identify those road sections upstream of each DBB for which they would collect and review the accident summary data. If these roadway sections were inappropriately truncated, and we will show below that this was the case, potential billboard-related crashes would be missed, and the identified correlation coefficients would be artificially and incorrectly reduced.

But the consequences of this error are even greater because of other mistakes made by the authors.

They report that, at 65 MPH, the VRD is approximately 0.2 miles with a VRT of 10 seconds (p. 79). But calculation demonstrates that, at 65 mph (95 ft/sec), 0.2 miles is traversed in 11 seconds, not 10. In addition, if the actual speed limit was 60 mph (88 ft/sec) and not 65 mph (see below), 0.2 mi requires 12 sec to travel. Thus, reviewing only those crashes that occurred within a 10 second VRT window would exclude an unknown number of crashes that might have occurred when a DBB was visible to an approaching driver. Further, the accuracy of the authors' selected VRD is further reduced because they made no allowance for the fact that billboards on the opposite side of the roadway from the driver's direction of travel (what they termed "left readers") have a longer viewing time than those on the near side, and by their commingling of VRD with their measurement of "distance to the nearest billboard" (pp. 45-46) - a term which they do not define.

But their error in relating VRD to speed exacerbates this problem. Although Table 2-3 (p. 15), "Visible Range of Billboards Along Interstate Routes;" is never discussed in the report, a review of its content sheds light on the issue. The table shows the "visible range," in miles and feet, for each of the seven DBBs in the study. Although never defined, visible range appears to represent the maximum distance at which each of the seven DBBs studied could be seen by an approaching driver; these distances range from a low of 0.28 to a high of 2.15 mi upstream of the sign. Translating these distances to time at 65 mi/hr, the DBB with the shortest visible range (#4) would be within an approaching driver's visual range for 15.6 seconds, and the billboard with the longest visible range (#5) would be visible for 118.9 seconds, nearly two minutes. Thus, the researchers' decision to review only those crashes within 10 seconds upstream of any billboard is insufficient even to assess the potential influence of billboard #4, the one with the shortest visible range - no less any of the other six, all of which were visible for greater distances, in one case more than ten times the limit chosen for data collection.

In summary, the consequences for compromising the validity of the data of this study are potentially high because the researchers' erroneous assumptions, even in light of their own documented sight distances, led them to exclude all crashes that might have been initiated in roadway segments further upstream from each of the billboards than they chose to study, but well within the visibility range of those billboards.

In addition to issues of sight distance, it should be obvious that every visible DBB along the route will have a different VRD and VRT depending upon numerous other factors, for example, sign location, elevation, angle toward the driver's eye, brightness, size of characters, roadway geometry, etc. None of these factors are addressed in the report.

If we look at legibility distance rather than visibility distance, the problem with the researchers' assumptions is similarly problematic. To take one example, if we assume (based on accepted industry practice) that 1 in of character height on a sign permits a legibility distance of 40 ft, and that a 14 ft tall billboard face (as were all seven in this study) with a character height of 75% of the available height or 10 ft 6 in (a reasonable assumption based on scaling the DBB images in Figures 2-4 and 2-8 of the report), then the legibility distance of such a sign would be 5040 ft (0.95 mi), nearly *five times* the VRD assumed by the authors.

So, if even the *legibility distance* of some of the DBBs studied is greater than the *visibility distance* accepted for analysis by the authors, there is a serious problem with the data that forms the basis of their conclusions. Further, given the size, brightness, and frequently changing imagery on DBBs, it is reasonable to assume that crashes initiated within a given sign's visibility distance must be considered, well beyond the legibility distance. In short, it is reasonable to assume that the gaze of an approaching driver might be attracted to, and that such a driver might be capable of reading, a DBB at far greater distances and for far longer periods of time, than the authors chose to evaluate in this study. It is reasonable to conclude, therefore, that the crash data accepted for inclusion in this study, based on the researchers' artificially constrained assumptions of VRD, has resulted in a substantial understatement of the true number of crashes that have occurred within the visibility and legibility range of the DBBs studied.

Finally, because Viewer Reaction Zone is never satisfactorily defined, the results reported in Tables 4-1 to 4-4 cannot be verified. Similarly, because the Visible Range is not defined, the results reported in Figures 4-2 to 4-9 must also be questioned.

"Data Bias" And "Intersection Bias"

One of the more troubling decisions made by Tantala and Tantala was to exclude from analysis any reported crashes that were attributed in the accident summaries to what they called "data bias." The reader cannot know exactly which such biases were excluded, because they are never clearly defined and because the descriptions of them change throughout the report. Indeed, as shown below, some of the stated biases are listed in certain report tables but not others. Their "data biases" included:

- Deer hits (sometimes called animal related)[6]

[6] Discussed in Tables 4-5, 4-6, pp. 45, 49, 77

- Driving under the influence of drugs or alcohol[7]
- Adverse weather[8]
- Speeding[9]
- Senior related[10]

While it might be argued that deer hits, speeding, and DUI-related crashes were appropriately excluded from the data analysis, it is understood that most crashes have multiple causes, and it is possible that driver distraction may have played a role in some or all such crashes as secondary factors even if it had not been identified as the primary cause in the original TCR. On the other hand, it is recognized that adverse weather conditions place higher perceptual and cognitive demands upon the driver, the very kinds of increased workload for which researchers, traffic safety experts, and regulatory authorities express the greatest concern about the potential distracting effects of DBBs. In addition, older drivers (as well as young, novice drivers) may be at higher risk for distraction-related crashes, particularly when driving demands are high (see, for example, Chan, et al., 2008, Speirs, et al., 2008, Fisher, 2009). Thus, the exclusion of such "data bias" from their analysis raises additional questions about the basis for the researchers' underlying assumptions. The authors' supporting statement that: "A more fair and unbiased comparison of accident data would exclude accidents from known causes" (p. 63) is neither explained nor justified.

But it is their decision to exclude accidents in the vicinity of interchanges, called "interchange bias" (pp. 49, 77), that is particularly troubling. In their own words, the authors excluded interchange-related crashes because interchanges are where "drivers undertake additional tasks such as changing lanes, accelerating/decelerating, negotiating directions, and attention to others undertaking these additional tasks" (p. 78). It seems obvious that such driver demands associated with intersections are the very types of challenges that are of concern to the traffic safety community, and because interchange areas are among the prime locations for high visibility billboards, their elimination from this study is a cause for concern. If there is one issue about which all of the research about billboard distraction and all of the published guidelines and regulations agree, it is that billboards, and particularly DBBs, should not be located near interchanges, precisely for the reasons that Tantala and Tantala excluded such accidents from their analysis. Indeed, the Farbry, et al., (2001) study for FHWA specifically noted that intersections and interchanges were highly demanding road locations, and that such locations should be included in any study of electronic billboards. Thus, the authors' decision to ignore all such data is of concern.

Although the decision to exclude crashes in the vicinity of interchanges is problematic for the "temporal" (before-and-after) study that the authors conducted, it is more harmful in that section of the report that deals with "spatial" factors. One concern is that the reader cannot know which accidents were excluded due to "interchange bias" because the

---

[7] Discussed in Tables 4-5, 4-6, pp. 45, 49, 77
[8] Discussed in Table 4-5, pp. 49, 77 ("snowfall" and "icy roads" on pp. 49, 77)
[9] Discussed in Table 4-6
[10] Discussed in Table 4-6 (age 65 and above)

authors describe this exclusion zone in two conflicting ways within the same sentence. They state, in part, that they excluded "those accidents and billboards on interchanges (entrances/exits) within one mile (1/4 mile on each side of an interchange)" (p. 78). Regardless of whether they actually excluded accidents within ½, 1, or 2 miles from interchanges, any resulting findings are confounded by the fact that at least three of the seven billboards chosen for study (#3, Figure 2-8; #4, Figure 2-10; #7, Figure 2-16) appear, from photographs, to be in close proximity to interchanges. Thus, given that some percentage of accidents in the vicinity of these DBBs was excluded due to the signs' proximity to the nearby interchanges, this artificially lowers the true number of crashes that may have been contributed by driver distraction due to these DBBs. As a result, the data for "bias adjusted" crashes in Tables 4-7 through 4-10, and in Figures 4-11 through 4-17 must be questioned.

Figure 1 below, taken from the ClearChannelOutdoor website, shows the researchers' Billboard Number 3 and its proximity to an I-90 interchange. As discussed above, Billboards 4 and 7 are also close to interchanges. This leads to the rhetorical question – if accidents in the vicinity of interchanges are excluded due to "interchange bias," and if DBBs are very close to interchanges, how can one capture and analyze accidents that occur close to the billboard? (Note that the authors provide no information about the proximity of any of the DBBs studied to the nearest interchange).

Figure 1. Proximity of DBB #3 to an interchange. This same DBB is shown in Figure 2-8, p. 16, of the Tantala study. It is also Site # 22 from the Lee, et al (2007) study, discussed in detail below.
(Source: http://www.clearchanneloutdoor.com/products/digital/don/cleveland/index.htm)

Decades of research into driver distraction has shown that alert, experienced drivers can tolerate some distraction when their task demands are not high, but that all drivers have upper limits on their cognitive capacities, and that there are certain road, traffic, and environmental conditions that may increase cognitive demands to the extent that additional sources of distraction should be avoided. Thus, the exclusion from analysis of some of the very types of crashes that might be *expected* to occur in the vicinity of DBBs is troubling, and, as with the decision to artificially truncate the data collection in road

sections upstream of DBBs, results in a likely substantial understatement of the actual crash statistics that took place in road sections where drivers were able to observe these DBBs. Taken together, the choice of crash types to exclude is a serious weakness of this study, given that some of the very kinds of crashes excluded are those that would be of direct relevance to the potential for distraction caused by billboards.

In summary, the authors' decision to exclude from study crashes that may have been affected by certain "biases" is critically flawed because it overlooks a basic understanding of traffic crashes – that they are frequently multi-causal – and it is precisely when such multiple factors are at play – adverse weather, older drivers, complex interchanges, speeding - that cognitive demands on the driver are increased and that irrelevant distraction cannot be tolerated. In other words, one should not exclude such factors because they cause "bias" – these are exactly the factors that interact to increase the likelihood of a crash when other factors such as inattention or distraction are present, and they must be investigated.

Inappropriate Statistical Methods, Assumptions, Analyses.

A key concern, raised by peer reviewers, about the findings of this study is that because of the limited before-and-after data collection periods (24 months) the sample sizes obtained are too small to conduct a meaningful statistical analysis. In addition to this concern, however, there remain others about the appropriateness of the research methods used and the results reported.

The analysis performed in this study is based on what the authors call "commonly accepted scenarios relating accident density to billboard density, to 'viewer reaction distance,' and to billboard proximity (how far the accident is from the nearest billboard)." But none of these terms is defined, no references to prior research are provided, and the conceptual drawing used to explain these assumptions in Figure 4-1 (p. 46) provides nothing more than a visual illustration of the authors' narrative statement. Thus, it is not possible for a reader to form an independent opinion of what was actually done, what assumptions were made, and how the data was collected and analyzed.

There are numerous examples of the erroneous use of statistics, both in terms of assumptions made, errors in application, and misuse of findings.

For example, the researchers define annual average daily traffic (AADT) as "the total volume of traffic in both directions of a highway or a road for one year divided by 365 days" (p. 33). But in their calculation of accident rates at "digital-billboard locations" (a term that they do not define), they fail to account for the fact that the seven DBBs studied were single-sided (i.e. they faced only one direction of travel). Thus, the authors have overstated the actual AADT by a factor of two, and the actual accident rate is therefore twice as high as reported.

In a section of the report titled "Accident Density and Billboard Density," it is clear that the researchers have inappropriately commingled DBBs with traditional billboards along

the route. By including all billboards in their metric for billboard density, they nullify both their ability to compare digital with conventional billboards, as well as their opportunity to compare digital billboards with the absence of billboards (an expressly stated objective of the study). This weakness is exacerbated because of their failure to control for the roadside environment (geometry, interchanges, presence of other objects in the roadside environment that might attract a driver's attention, etc.) in areas where billboards were present from those where they were not. For these reasons their statement that: "If a noticeable correlation between billboards and accidents exists, then one would expect a significantly larger number of accidents in areas with relatively high billboards densities" (p. 78) is unsupportable.

As part of their statistical treatment of the data, the authors invent meaningless terms such as "noticeable correlation" (p. 78). Further, despite their correct understanding that correlation does not imply causation, they suggest otherwise on several occasions (see, for example, pp. 2, 98). Further, they inappropriately suggest that no correlation less than 1.00 is indicative of any relationship. For example, they state: "Statistically, a correlation coefficient of 0.7 or smaller is considered to indicate 'weak' correlation, at best, and does not indicate much difference from correlation coefficients of zero" (p. 81). Quite to the contrary, results from traffic safety research in the real world would typically consider correlation coefficients of 0.7 to be quite high.

The researchers undertook both a "spatial analysis," discussed above, and a "temporal analysis" to examine the incidence of crashes at locations where billboards had undergone conversion from traditional (fixed) to digital display. Data was collected for 18 and 24 months prior to, and after, the conversion. Although this before-and-after analysis is a necessary component of such an analysis, it is not sufficient. There is, in fact, an essential weakness to the temporal analysis performed in this study. That is that the researchers failed to compare the data at the billboard conversion sites to data at comparable locations at which there were either no billboards present, or billboards that were present but not converted to digital. It is possible that crash rates remained essentially the same in road sections featuring converted billboards (as these authors reported), but actually decreased in sections that included non-converted billboards, or at non-billboard locations, during the same before-and-after study period. This very result has been found in an earlier study of a single digital billboard near Boston (Massachusetts Outdoor Advertising Board, 1976), and led directly to the order that the sign be removed.

This failure of the temporal analysis underlies the authors' inability to answer the question that they posed early in the report: "...what is the statistical relationship between digital billboards and traffic safety?" (p. 4). This question is the one that should have guided this research. However, the next sentence, also posed in the form of a question, asks: "Are accidents more, less, or equally likely to occur near digital billboards compared to conventional billboards?" Unfortunately, it was this second question that guided the research, not the first. In other words, this study was not designed to investigate the potential impact on crashes of digital billboards compared to the *absence* of billboards; rather, it made the unjustified and unstated assumption that conventional billboards were the acceptable baseline for comparison with DBBs. As a result of this

assumption, the research methodology did not include true comparison sites where billboards were absent, and thus any assessment of the contribution to crashes from DBBs against a true baseline were impossible.

The announcement of the availability of this report on the website of the OAAA stated that this study "offers conclusive evidence that traffic accidents are no more likely to happen in the presence of digital billboards than in their absence." Clearly, since the researchers made no comparisons between crashes in the presence and absence of DBBs, this claim is unsupportable.

Oversights, Omissions, and Evidence of Bias.

As discussed above, the metrics that the authors used to define the roadway sections for which accident report summaries were analyzed were called "viewer reaction distance" and "viewer reaction time". Obviously, each of these values is determined, in part, on the posted speed limit or on prevailing speeds. The authors claim that they used speed limit as their determinant, and that the posted limit was 65 MPH in all cases (p. 79). But this is incorrect. Figure 2 below clearly shows the posted Speed Limit to be 60 MPH. Although the reader cannot know whether this speed was in effect at all of the studied sites, it was clearly the case for DBB #4. The significance of this error would differ for each site, depending upon the sight distance for drivers approaching the billboard in question. At 60 MPH, a driver approaching a DBB will be able to see and read the billboard for a longer period of time than would be the case at 65 MPH, thus requiring data to be collected and analyzed for a longer roadway section upstream of the billboard, and far longer than any section that the authors chose to use. In other words, possible driver distraction from a DBB might well have occurred earlier than the authors reported, and, as a result, possible distraction-related crashes were artificially excluded from the database.

Figure 2. Image showing DBB #4 adjacent to posted Speed Limit signs. This image shows the same DBB depicted in Figure 2-10, p. 17 of the Tantala study. Interchange signs can clearly be seen, as can an additional billboard in the driver's view. This is the same sign represented as Site No. 42 in the Lee, et al. report discussed below. (Source: http://www.clearchanneloutdoor.com/products/digital/don/cleveland/index.htm)

The authors fill their report with information irrelevant to the study, while ignoring information of interest. For example, on pages 23-27 and in Tables 3-1 and 3-2, they describe in detail the total number of miles of interstate highways in the state and county, the terminus of each roadway, and the base and surface type of all pavements. On pages 29-31, they provide cursory information about the location of each of the studied billboards – again providing data on road surface and previous state work projects, and repeating, verbatim, information already presented on pages 10-11. However, no information is given about relevant concerns such as horizontal and vertical curvature, merges or lane drops, presence of official signage, proximity of DBBs to interchanges, multiple billboards within a driver's line of sight simultaneously, or intersection characteristics such as entrances, exits, gores, etc., either for the system as a whole or within the vicinity of the studied DBBs.

Bias is evident throughout the report. For example, the authors' state that their numbering system for the billboards studied was "arbitrary" (p. 10), but a review of the website of the billboard owner, ClearChannelOutdoor, shows that this information was supplied by them. Several figures and tables in the report are taken directly from the ClearChannel

website, and a ClearChannel executive was quoted as saying that his company had "hired" the researchers to perform the study (Slobodzian, 2007).

It is typical in a research study such as this for the authors to identify prior research and other sources that have informed their assumptions, methods, and conclusions. However, despite listing 17 references, none are actually cited in the text. In addition, references made within the report of prior research are not accompanied by citations; thus it is not possible for the reader to verify the basis of the authors' claims.

Author Response.

One of the two authors of the paper, in a letter sent to the Director of Right-of-Way for the Texas Department of Transportation (Tantala, 2007) responded to the previous Wachtel (2007) review and took issue with a number of statements made in that review. This section discusses the Tantala response, and our conclusions based on a review of the response and a resultant re-review of the paper and our comments to it.

The Tantala letter takes issue with two major criticisms that were included in the Wachtel report (and are discussed in detail above). First, Tantala argues that the Wachtel criticism of the report's exclusion of accident analyses beyond the VRD (approximately 0.2 miles upstream of the DBBs at 65 mi/hr) "misrepresents our analysis, because we did not exclude larger ranges. In fact, our analysis compiled statistics for a wide range of vicinities" (p. 1). A review of the Tantala letter and a re-review of the original report reinforce our original criticism. The key phrase in the Tantala letter is: "...we examined accident data and statistics..." While that may be true, any such data and statistics were not analyzed, and no supportable conclusions could be drawn from them. Indeed, the Tantala letter refers the reader to two report Tables (2-3 and 4-11) and two Figures (4-24 and 4-25) in support of his arguments. Our re-review of Table 2-3 (p. 11) confirms that this table merely identifies the "visible range" for each of the seven DBBs. Table 4-11 (p. 84) shows "correlation coefficients of various comparisons," and the one of relevance here, accident density vs. VRD, simply reaffirms our criticism. Finally, the two cited figures (pp. 90, 91) present nothing more than summary statistics (raw accident counts) without analysis.

The second point made in the Wachtel review with which Tantala takes issue is that "the review opines that our analyses should not exclude 'bias' factors because accidents are often multi-causal and those are the very factors that increase the likelihood of accidents" (p. 2). Tantala expresses his agreement with Wachtel's opinion, and states "we did include this in part of our study. In fact, we performed an analysis that included all data collected and compiled by the State of Ohio.... This robust, comprehensive and all-inclusive data-set includes the very multi-causal accidents that the review references" (p. 2)." But the Tantala letter provides no link or reference to any pages, tables, or figures in the report where a reader might find these all-inclusive analyses (those in which the stated biases were included in the analyses). Indeed, our re-review of the paper, undertaken as a result of the Tantala letter, finds no such analyses. In fact, only Table 4-5 (p. 54) addresses the all-inclusive vs. bias-adjusted accidents, and it merely presents the

summary statistics of raw accident counts and accident rates with no accompanying analysis. In contrast, after stating: "A more fair and unbiased comparison of accident data would exclude accidents from known causes" (p. 63), the report presents a series of four tables (4-7 through 4-10) and seven figures (4-11 through 4-17) that present "the number of accidents with statistical bias events excluded within the visible range" (p. 63). If there was any comparable presentation of the all-inclusive data within the report, this reviewer could not find it.

In summary, Tantalus's letter defending the study against Wachtel's criticisms does nothing to challenge the points made in the review and, as a result, reinforces the original concerns raised by Wachtel.

Lee, McElheny, & Gibbons (2007).

As is the case for the Tantala and Tantala study discussed above, this study was performed for the Foundation for Outdoor Advertising Research and Education (FOARE), an arm of the Outdoor Advertising Association of America (OAAA). It, too, has been previously reviewed (Wachtel, 2007), and the complete report can be accessed at: http://www.sha.state.md.us/UpdatesForPropertyOwners/oots/outdoorSigns/FINALREPORT10-18-GJA-JW.pdf . Below we will review the major reported findings of the Lee, et al., study, and discuss our principal concerns about the efficacy of this work.

The approach to this study was completely different from that of Tantala and Tantala, although the two studies used the same DBBs. In this study, an instrumented car was driven along a prescribed route by a volunteer sample of drivers, and some of their driving behaviors and eye glances were recorded as they passed previously identified and defined locations.

Study Overview.

In the main study, 36 participants drove an instrumented vehicle along a pre-determined 50-mile route on surface streets and interstate highways in the Cleveland, Ohio area. During the drive, the participants passed a number of DBBs, conventional billboards, "comparison" and "baseline" sites. In the final 8 sec of their approach to each of these sites or "events," the direction of their eye glances was recorded, along with their lane keeping and speed maintenance performance. A subset of 12 participants also drove a similar, but shortened, route at night.

Methodological Concerns.

Eye Glance Recording.

Eye movement recording and analysis is a time-proven method for determining where drivers are looking as they drive. Until recently, however, it has not been possible to obtain precise eye glance data (with a precision of 1 deg or better) without the use of

highly intrusive, head mounted equipment. The trade-off is to use recording equipment that is mounted on the dashboard or other interior vehicle structure, but the weakness of this less intrusive system is that eye glance information can then be obtained only for more gross directions of gaze. In other words, while it is possible to record the general direction in which a person is looking, it is not possible to know with confidence the exact object (no less an image within that object) being viewed, or the distance from the eye at which that object is located. Because this study employed such vehicle-mounted equipment, the researchers could report only on the general direction of gaze and could not identify if, or when, a participant was looking at a specific object (such as a DBB) in the visual field.

Eye movement recording equipment must be calibrated separately for each participant, and this calibration should be performed both before and after each participant's drive. This is because eyeglance recording equipment can "drift" over time, vehicle vibration during the drive could have changed the mounting position of one or more cameras, or the driver could have adjusted the seat or otherwise shifted his or her position while driving. Unfortunately, the authors calibrated the equipment only after each participant had driven the route, and thus could not know whether the eye glances that they captured were accurate and reliable.

Lack of control over site variables

The authors conducted their on-road studies on "interstate, downtown, and residential road segments" (p. 27). Given that all five DBBs (study sites) were on interstate highways, the decision to include some of the control sites (baseline, conventional billboards, comparison sites) on roads other than interstates confounded the data collection and made meaningful comparisons across sites impossible. When conducting field research, the goal must be to reduce, wherever possible, extraneous sources of variability. In this study, the decision to include study sites (DBBs) on interstates and some control sites (the reader is not told which or how many) on surface streets leads to additional uncontrolled sources of variability. Some of the significant differences between these two types of roadways, any or all of which may have affected the data, are: traffic speeds and flow; illumination levels; sight distances; access control; at grade vs. grade separated intersections; presence or absence of traffic signals; and divided vs. undivided traffic.

Even for the five DBBs that were the principal focus of this research, the authors seem to have made no attempt to identify, no less control, extraneous variables such as traffic speeds and volume, horizontal and vertical curvature, or other roadway and traffic characteristics that might have interacted with the variables of interest. Further, the distance between adjacent study sites was often very short. For example, using the Haversine formula, we calculated the distance between Site 37, a DBB, and Site 36, a baseline site, as less than 1.2km. Other studied sites might have been even closer to one another. Thus it is likely that the visibility ranges for adjacent sites overlapped, confounding eye gaze and vehicle performance measurements and comparisons.

The researchers selected some study sites on the right side of the road and some on the left, then recorded and analyzed whether drivers glanced in the direction of these sites as they approached and passed them. In some cases they found examples of participants looking in the direction opposite to the site being studied. When such behavior occurred in the presence of billboard sites, they interpreted this to mean that the billboard did not draw the driver's attention. But there is no evidence to suggest that they sought to identify or control for the possible presence of billboards or other attention-getting targets that may have existed opposite from their study sites or otherwise within the driver's field of view simultaneously. In other words, when they selected a study site on the right, there is no indication that they made sure that there was nothing on the left that might capture the driver's attention. If, in fact, they did not identify and control for such opposing sites, then the eye glance data that they captured are suspect. Since they do not report any efforts to evaluate and control for such conditions, one must assume that they did not do so. In short, it is entirely possible that glances to the left when a billboard was on the right (or conversely) were made because there was a competing, perhaps more compelling, site across the road from the study site that was neither controlled nor evaluated. Figure 1, for example, shows the DBB that served as Site # 22 on the right side of the road[11]. But the figure also shows a large billboard on the left side of the road that appears in the center of the image. If the researchers captured eye glances straight ahead or to the left at this location, they might have been due to the participant looking at this uncontrolled billboard. A similar concern exists for uncontrolled sites that might exist on the same side of the road as a site of interest and within a driver's field of view as he or she approached that site. Given the lack of precision of the eye gaze data obtained, there was no way for the researchers to know whether a particular participant was looking at the study site or an unidentified site visible simultaneously for which they did not control.

Although the five DBBs studied were all of the same size, the reader is given little information about other important characteristics of these signs; characteristics that could have had a direct impact on their attention-getting qualities, such as their height, angle to the drivers' line of sight, and proximity to the road. Further, the reader is told little about roadway geometry, prevailing traffic speeds and volume, etc. Any of these factors may have affected the comparability of sites. Even though all five DBBs were 14' high and 48' wide, they were mounted at very different heights relative to the road surface. Further, there was no consistency of sizing of conventional billboards or signs on the comparison sites. Indeed, the researchers state that conventional billboards included a "few" that were of other sizes, including "standard poster, junior paint, and 10'6" x 36' bulletins" (p. 21). Since the size of a billboard or other sign, and thus the size of the characters that can be displayed on it, likely has a direct relationship to the distance from which it can be seen and read, this failure to control for sign size and other characteristics relative to a sign's visibility and legibility range is an important oversight. In our opinion, without any effort to control these basic site and sign characteristics, it is difficult for the researchers to defend any interpretations they may have made from their data in comparing driver responses to DBBs against responses in other locations.

[11] Note – this figure was taken from the ClearChannelOutdoor website – it was not shown in either of the two studies discussed herein although we have confirmed that it is the study location cited in the reports.

Confounding of data collection sites.

The researchers selected four types of "events" or "sites" at which to collect data. For the main (daytime) portion of this study, there were 5 DBB locations, which we have called study sites, and three other types of locations, which we have called control sites. The latter included 15 "conventional billboards," 12 "baseline sites," and 12 "comparison sites." Because the report provides no images or drawings of any of the 44 locations, and because the descriptions and definitions of the site characteristics, particularly for the baseline and comparison sites, are vague and inconsistent, it is not possible for the reader to determine just how these site types compared to one another. For example, at one point, the authors state that baseline sites contained no signs of any kind (p. 6). At another, the reader is told that some baseline sites (the authors do not state how many) in fact, did contain signs. A more serious concern, however, is with the multiple, conflicting definitions and descriptions of the comparison sites. The reader is first told that comparison sites are "similar to items you might encounter in everyday driving" (p. 8). On page 21, these sites are described as "areas with visual elements other than billboards." Later on the same page the reader is told that some of these sites included on-premise signs, variable message signs, and "digital components." Finally, Table 2 (p. 22) describes one comparison site as a "tri-vision billboard" and three others as "on premise LED billboard(s)." To the average motorist, and from the perspective of driver distraction potential, the distinction between an on-premise and an off-premise digital sign display is meaningless. One must conclude that at least some of the comparison sites may have been just as visually compelling and distracting, if not more so, than the DBB sites that were the principle focus of the study. Clearly, this intentional confounding of study and control sites (the researchers selected each of the sites to study) would artificially reduce any adverse findings from DBBs by showing them to be no worse than existing sources of distraction present at the comparison sites.

As expected, the study's findings bear out this concern in that, for many measures, the DBB and comparison sites elicited similar results, and these results differed, often significantly, from those obtained at conventional billboard or baseline sites. The problem for the researchers is how to treat these findings given their *a priori* inappropriate site selection decisions; the problem for the reader is how to interpret them. In our opinion the approach adopted by the researchers is seriously flawed. It takes the clear evidence found in this study that roadside digital advertisements (whether on- or off-premise) are associated with adverse driver performance, and manipulates this evidence to suggest that there is no problem with digital billboards because drivers are equally distracted by other "comparison" sites. In short, the authors' false assumption that their chosen comparison sites were appropriate control locations against which to compare the effects of DBBs enables them to slant their findings to suggest that, because driver performance in the presence of digital billboards is similar to their performance in the presence of these equally distracting "comparison" sites, there is no cause for concern about the safety of DBBs. We believe that the data suggests otherwise, as discussed below.

The choice of an 8-second data recording interval.

The researchers chose a time period of 8-sec in advance (upstream) of each site during which to record driver performance and eye glances. This data recording period ended when the instrumented vehicle passed each event. The assumption that 8 sec was a reasonable data capture interval, and the researchers' ability to define and measure this interval, raises several methodological concerns.

At 65 mi/hr, the presumed speed on the freeways studied, a vehicle travels approximately 95 ft/sec. Thus, during an 8-second interval, a vehicle will travel 760 ft. The accepted practice for highway signs is that 1 in of letter height can be read from approximately 40 ft. So, for a billboard with 24 in high characters, the sign can be read from approximately 960 ft. Indeed, several of the billboards used in this study likely included characters much larger than 24 in and thus could be read at even greater distances (given clear sight lines upon approach). Figure 3, enlarged from Figure 2-4 (p. 13) of the Tantala and Tantala study, depicts characters approximately 84 in high (the DBB face is 14 ft tall). These characters are theoretically legible (no less visible) from a distance of 3,360 ft. At 65 mph, this sign could be read for approximately 35 sec, more than four times the data collection interval used in this study. In addition, because of the brightness, contrast, and image quality of digital billboards, and the fact that (in Cleveland) their messages change every 8-seconds, it is apparent that driver attention to the billboard may be initially attracted at far greater distances than those at which the message can actually be read. As a result, the choice of an 8-sec data recording interval is likely to result in a substantial understatement of the distracting effects of digital billboards compared to other roadside sites including more traditional billboards and on-premise signs.

Figure 3. An enlargement of the DBB that served in both the Tantala & Tantala and Lee, et al. studies. Scaled measurement shows the numerals to be approximately 84 in. high.

The authors state that they chose an 8-sec data collection period because the "digital billboards were programmed to change messages instantaneously once every 8 seconds; an event length of 8 seconds thus made it highly likely that a message change would be captured during the event" (p. 21). This argument is flawed for several reasons. First, as described above, the sight distance and legibility distance, coupled with the size of the signs studied and their character height, demonstrates that digital billboards can be seen and read far earlier than 8 sec in advance of the sign, thus suggesting that the data recording interval should have been much longer. Second, had the researchers selected *any* data recording interval longer than 8 sec, it, too, would have permitted them to capture a message change during each driver's approach to the event. Finally, despite their understanding of the potential importance of a driver observing a message change during his or her approach to the DBB, the researchers never actually reviewed or analyzed any data related to this message change, and therefore had no way to evaluate any possible driver response to it.

Some signs are located perpendicular to the driver's direction of travel. Others, such as some two-sided billboards and many on-premise signs, may be located at other angles, including parallel to the driver's direction of travel (such as when mounted on a building façade). In addition, the lateral distance of each sign from the driver's line of sight varies greatly as a result of factors such as: lateral distance from the road edge, and the number and width of lanes, medians, and shoulders. If the same 8-sec point for passing a sign was applied regardless of sign angle and lateral distance, then some signs would be visible to drivers for less time than others, thus rendering the 8-sec recording interval inconsistent across the studied sites.

In summary, the researchers' choice of an 8-sec data recording interval was inappropriate for several reasons, and resulted in unequal exposure to signs of interest across sites. A more appropriate way to determine the data collection interval would have been to identify the point at which a billboard or other sign of interest fell outside a predetermined angle of view from the driver's line of sight along the road axis, and to define the data recording interval upstream from that point. This would have assured a more equitable, and comparable, identification of sight distance and would not have had the effect of artificially reducing the available glance times and control measurements made for the signs of interest in this study.

Measurement of nighttime luminance levels.

The authors measured the luminance levels of different sites at night. They took these measurements from the participant-driver's eye position, a decision which masked and minimized the actual brightness differences between the DBBs and the other sites. A more appropriate comparison would have been from measurements taken directly in front of each of the signs of interest (as recommended in, for example, TERS, 2002; NYDOT 2008a) so that the authors could be sure that they were comparing sign against sign without the contribution of the general ambient environment. Several other weaknesses affected this measurement approach. First, taking measurements from the driver's position would have yielded non-comparable readings even if every sign had the same luminance, merely because the signs were positioned at different angles to the driver, and

were located at different horizontal and vertical distances from the driver's eye. Second, the authors do not state whether some of the (non-DBB) sites measured at night were those on surface streets and whether there were fixed luminaires within the range of the luminance meter at such sites. The presence of fixed lighting would also have reduced the actual luminance differences between DBBs and other sign sites. Third, since the DBB displays changed every 8 sec, the luminance levels on these signs changed accordingly. Thus, unless the researchers measured each DBB with the identical display (highly unlikely), they would have no way to compare the light output of the different DBBs. They would not know, for example, whether measured differences between DBBs were due to actual sign output, different brightness settings, or differences between displayed messages. Despite these limitations in measurement strategy, however, and despite the fact that the digital billboards were automatically dimmed at night, the authors recorded nighttime luminance levels at the driver's eye position that were, on average, 10 times greater for the DBBs than for baseline sites, approximately 3 times brighter than sites with conventional billboards, and approximately 2.5 times brighter than comparison sites. The authors' state: "this probably explains some of the driver performance findings in the presence of the digital billboards" (p. 68).

Inappropriate and Inconsistent Statistical Treatment.

Eye glance recording and long duration eye glances.

One of the greatest weaknesses of this study is the authors' failure to follow their own recommendations as expressed in their review of the work by Wierwille (1993), Horrey and Wickens (2006), and the "100 car study," (Dingus, et al., 2006). This error is compounded by their questionable decision to analyze and present only selected data that they collected, choosing not to report their own findings that might have undermined their conclusions. These actions require some explanation.

The authors collected and recorded four types of eye glance behavior at each of the four types of sites: glance frequency, glance duration, average duration per glance, and total eyes-off-road time. Of these four measures, those that deal with the duration of eye glances off the road are of the greatest relevance because long duration eye glances at distracting stimuli have been implicated as predictive of crash risk in several prior studies, including those by Wierwille (1993), Smiley, et al., (2005), Horrey and Wickens (2006), and Klauer, et al., (2006a). Lee and her colleagues are clearly aware of this work, as they state as early as the study abstract: "Various researchers have proposed that glance lengths of 1.6 seconds, 2.0 seconds, and longer may pose a safety hazard" (p. 6). The authors follow this statement with an overview of their own results, in which they claim to have found no pattern of longer glances to the digital billboard sites: "An examination of longer individual glances showed no differences in distribution of longer glances between the four event types" (p. 6); and: "An analysis of glances lasting longer than 1.6 seconds showed no obvious differences in the distribution of these longer glances across event types" (p. 9). These two statements are misleading, and wrong, as discussed below.

In their introductory description of eyeglance results (p. 52) the authors list the seven questions that they sought to answer with the eyeglance data collected. The seventh question was: "Are longer glances (longer than 1.6 s) associated more with any of the event types?" This is, of course, a key question, because of recent research that identifies such "longer glances" as being associated with a higher crash risk. After listing the seven questions, Lee and her colleagues present a summary and analysis of their findings relative to each. For six of the seven questions, they performed an analysis of variance (ANOVA) to analyze the data, and they report their tests of statistical significance in both graphical and narrative form (see Figures 17-22, pp. 53-58). It is only for the key Question 7, the one that addresses longer glance durations that the authors apparently performed no such analysis and offered no test of statistical significance (see Figure 23, p. 59). The reader might ask why, but the authors provide no explanation. After restating Wierwille's recommendation that 1.6s be used as a criterion representing a long glance away from the roadway, and after again explaining that their approach in analyzing this data followed that recommended by Horrey and Wickens, "who suggest analyzing the tails of the distributions whenever eyeglance analysis is performed" (p. 59), Lee and her colleagues failed to perform this analysis. Instead, it appears that they performed nothing more than a visual inspection of the data presented in their Figure 23 (p. 59), the figure that depicts the distribution of glance durations for the four different event types. Perhaps as a result of performing only this visual inspection, they state: "As shown in Figure 23, the distributions of glance duration were similar across all event types, and there was no obvious pattern of longer glances being associated with any of the event types" (p. 59). This statement is wrong, as discussed below.

This failure to report key findings is even more surprising because of the results that the researchers obtained in response to their Questions 5 and 6. These two questions asked whether the "mean single glance time" varied according to the type of event. Question 5 asked this question for events on the left side of the road; Question 6 addressed events on the right side of the road. In both cases, the Lee and her colleagues found that digital billboards and comparison events had statistically longer mean single glance times than did baseline or conventional billboard events ($F_{3,73} = 3.59$, $p = 0.0176$ left, and ($F_{3,77} =$ 3.73, 0.0147 right), and that the DBB and comparison sites did not statistically differ from one another. In addition, in an effort to "increase power and verify the above findings" (p. 60) the researchers aggregated the left and right eyeglance data. This combined analysis confirmed with statistical significance ($F_{3,91} = 4.98$, $p = 0.0030$) that "digital billboards and comparison sites did not differ from one another, but each differed from conventional billboards and baseline events" (p. 60).

These findings alone should have led the researchers to statistically evaluate the longest such glances, the tails of the distribution, as they said they would in posing Question 7, and as they did for every other question.. But they did not do so.

Figure 4, below, reproduces the authors' Figure 23 (p. 59) together with its original caption.

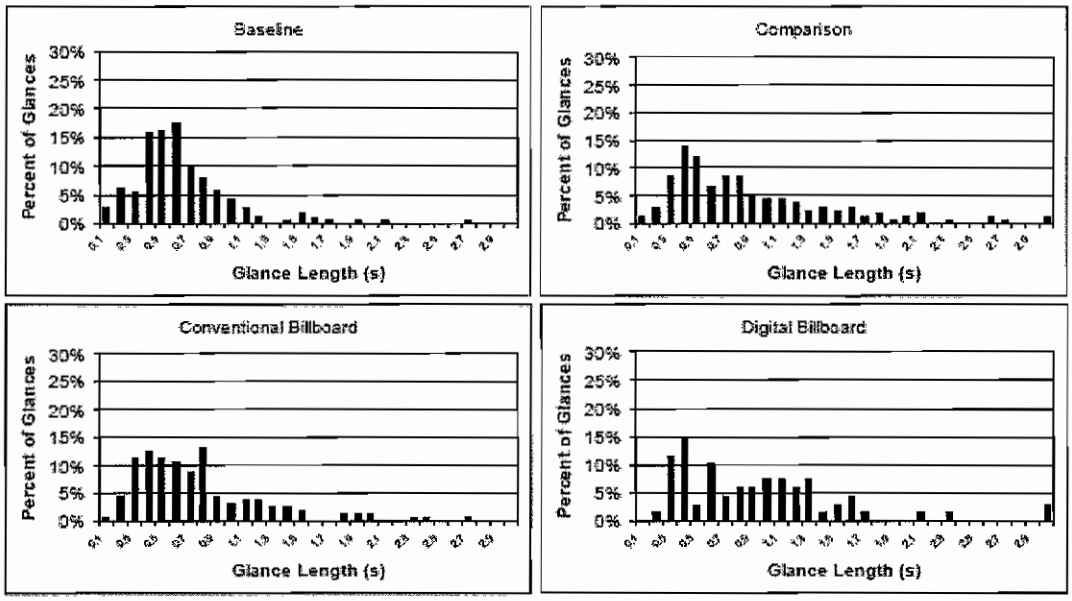


Figure 23. Tails analysis for the distribution of glance duration, (method described in Horrey and Wickens, 2007).

Figure 4. A reproduction, in original size, of the authors' Figure 23 (p. 59), together with its original caption.

The authors do not provide sufficient information about these measured glance durations to permit the reader to perform an independent analysis of their data. However, an inspection of enlargements of these four charts enables a non-statistical independent review of their findings. Using the tails analysis as recommended (but not performed) by the authors (following Horrey and Wickens), and using both 1.6 sec (the Wierwille criterion) and 2.0 sec (the 100-car study cut-point), we find the following:

> Approximately 5.5% of baseline sites and 7.5% of conventional billboard sites captured glances of 1.6 sec or longer compared to 13% of DBBs and 16% of comparison sites.
>
> Approximately 2% of baseline sites and 4.5% of conventional billboard sites captured glances of 2.0 sec or longer, compared to 7% of DBBs and 8% of comparison sites.
>
> No glances longer than 3.0 sec were made to either the baseline or conventional sites, but glances of 3.0 sec or longer were made to both DBBs and comparison sites.

In summary, this visual inspection of the researchers' data suggests that long glances occur two-to-three times more often with DBBs and comparison sites than they do with baseline or conventional sites, and that the longest glances (3.0 sec or longer) occur *only* with these sites. These results suggest important differences for the longest glances, the

ones that highway safety experts are most concerned with. One must ask why the authors chose not to perform a statistical analysis of this data, particularly when they did so for every other set of eyeglance data, and why they reported that their visual inspection of these data suggested that there was "no obvious pattern of longer glances being associated with any of the event types" (p. 59). The report offers no explanation.

Misleading and Inconsistent Reporting and Evidence of Bias.

Throughout the report, there are conflicting and inconsistent statements, and evidence of bias.

Was this a "naturalistic" study?

Although described by the authors as a "naturalistic study," and modeled superficially upon the much larger, 100-car study performed at the same institution – (Dingus, et al, 2006; Klauer, et al. 2006a,b), this study exhibits few of the characteristics of a true naturalistic study (Hanowski, 2009).

Although they used an instrumented vehicle with on-board cameras, and although their participants drove the route without a researcher present in the vehicle, this study differs significantly from the 100 car study in several key ways. First, the four on-board cameras used to record views of the road and of the drivers' glances were not unobtrusive as they were in the 100 car study. Rather, they were prominently located on the driver's side A-pillar and adjacent to the rear view mirror. These camera locations are shown in Figures 8-10 of the report (pp. 32-33). Second, the duration of the present study was less than two hours per participant, whereas, in the 100 car study, participants kept their instrumented vehicles in their possession and used them daily for several months. Third, participants in the present study had to follow a prescribed route (to ensure that they would pass the DBBs and other events that were the subject of the study), using a set of printed instructions taped to the dashboard, whereas in the 100 car study, participants were free to drive when and where they chose in the course of performing their daily activities. In short, whereas the participants in the 100 car study may well have become acclimated to their test vehicles over time and ignored the fact that they were participating in a research study, the participants in the current study were fully aware that their performance and behavior was being monitored and recorded – thus their behavior could not reasonably be described as "naturalistic."

Literature Review.

The authors' approach to their literature review is illustrative of the bias shown throughout the report. There is a long history of published literature examining the relationship of roadside billboards to crashes and to driver behavior. Relevant studies dating as far back as 1934 have been identified and reviewed by others; and research continues to be conducted and reported to the present day. The authors chose to discuss only a small, highly selective subset of these studies. As will be seen below, it is clear that the studies reported, particularly the early work in this field, were selected because they were supportive of the authors' position. When they cite studies that reported findings at odds with their position, the authors dismiss them as poorly done or irrelevant;

conversely, studies that report findings consonant with these authors' views are praised with descriptors such as "rigorous."

Their reporting about two early epidemiological studies is illustrative of their approach to the literature. The authors cite an article by Rykken (1951), a two-page interim progress report on a roadside study conducted in Minnesota. They quote from Rykken: "...no apparent relationship was found between accident occurrence and advertising sign type or location" (p. 12). What they fail to say, however, is that Rykken called his result "a very preliminary study of approximately 170 mi. of the 500 mi. study segment (p. 42). Significantly, Lee, et al. fail to cite the final report of the subject study (Minnesota Department of Highways, 1951) which concluded, in part: "An increase in the number of advertising signs per mile will be accompanied by a corresponding increase in accident rate" (p. 31), and "intersections at which four or more (advertising) signs were located had an average accident rate of approximately three times that for intersections having no such signs." This final report has been extensively cited and reviewed by previous researchers. Wachtel and Netherton (1980), in particular, discussed it at length. It is puzzling, therefore, why these authors cited the interim progress report and ignored the final document.

Lee and her colleagues followed the same approach in their review of a parallel study conducted in Michigan. They cite an interim study report by McMonagle (1951) that looked at only partial findings (p. 12), and ignored the study's final report (Michigan State Highway Department, 1952) which found that illuminated advertising signs showed "an appreciable association with accident locations" (p. 6).

In a confusing discussion about a study by Rusch (1951) which analyzed crash reports on Federal and State highways in Iowa, the authors fail to report on Rusch's own published results, and offer no evaluation of his actual study. Instead, they cite a brief review by Andreassen (1985) (ignoring all other published reviews of the Rusch work) which stated, in part: "the greatest number of inattention accidents occurred on the sections where business and advertising predominated as the roadside property usage, but this does not prove anything about the effect of advertising signs on accident occurrence" (p. 13). Given that Rusch's actual findings, despite methodological weaknesses that often affected these early field studies, demonstrated that the number of accidents was more than double in the study section (where 90 percent of the businesses and roadside advertising signs were located) than in either of the two control sections, given that "inattention" accidents predominated over both "business" and "other" accident categories in this study section, and given that the results were confirmed after statistical correction for mileage per segment, the researchers' treatment of this study is puzzling.

Obfuscation of Study Purpose and Intentional Confounding of Study Sites

The stated purpose of this study was to "assess the effects, if any, of digital billboards on driver behavior and performance" (p. 8), *not,* as suggested in the Abstract, to ascertain whether driving performance in the presence of digital billboards was similar to performance in the presence of other, primarily on-premise, digital signs. As discussed

above, the researchers clearly found that DBBs *did* have an adverse impact on driving performance, and the fact that this adverse impact was similar to the adverse impact from similarly distracting signs that might have been on- rather than off-premise does not diminish this finding nor make it acceptable. The authors admit that "there are measurable changes in driver performance in the presence of digital billboards" (p. 6), and, as demonstrated in the body of their report, these changes are adverse and statistically significant. It is inappropriate to suggest that such adverse impacts are deemed acceptable (or "safety neutral" in the authors' coinage) merely because they "are on a par" with the adverse effects of other digital signs that happen to be other than billboards because they may be located on the premises of roadside businesses.

Baseline sites should have been, as stated in the abstract, "sites with no signs." But, as described elsewhere in the report, an unidentified number of them *did* contain signs, thus diminishing their potential to serve as true control sites and, likely, minimizing the differences in glance behavior between DBBs and true baseline sites.

In direct conflict with a statement in the Abstract, and as discussed in detail above, longer individual glance patterns (greater than 1.6 and 2.0 seconds) *did* show differences (actually, rather dramatic differences) between the event types. In fact, per the authors' own statements elsewhere in the report, and as shown by several other researchers, these differences at the tails of the distributions for glance duration may be critically important in assessing the true impact of digital billboards on driver performance and behavior. Similar misstatements are made throughout the Executive Summary, and will not be repeated here. However, the expressed "finding" that: "An analysis of glances lasting longer than 1.6 seconds indicated that these longer glances were distributed evenly across the digital billboards, conventional billboards, comparison events, and baseline events during the daytime" (p. 7) is clearly inaccurate. Critically, the data discussed in this "finding" was not analyzed by the researchers in accordance with their own data analysis recommendations, nor was such data even collected for the abbreviated nighttime study, when we would have expected such findings to be even more dramatic than they were in the daytime study.

The authors identified five DBBs for study. These are identified by latitude, longitude, route number, and side of road in Table 2 (p. 22), and shown graphically on a map in Figure 2 (p. 23). With this information, that reader can view images of these DBBs from either the Tantala report or from the website of ClearChannelOutdoor, at http://www.clearchanneloutdoor.com/products/digital/don/cleveland/index.htm . Examination of Figures 1 and 2 in our report may lead the reader to question the accuracy of the authors' statement that: "The Cleveland digital billboards…were located off to the side of the roadway in straight-away sections of interstate with no interference from hills, curves, or intersections" (p. 19).

The authors provide voluminous data for irrelevant issues (e.g. 124,740 video frames analyzed, 96,228 data points collected, 8,678 eye glances identified, etc.) but offer no information useful to readers who might want to know what was actually studied. For example, there are no images of any of the billboards or other sites studied, there is no

indication of the precision with which eye gaze was captured, etc.). It appears as if the researchers intended to overwhelm the reader with useless information in an attempt to avoid questions about the real issues.

There are numerous statements throughout the report that, on the one hand, are irrelevant to the study, and, on the other, demonstrate a clear pro-billboard attitude. Some examples:

> "The lead author of this report recently participated on an expert panel charged with providing recommendations for a minimal data set to be included on police accident reports; billboard were never raised as a possible distraction…" (p. 11).
>
> "After a long gap in research, there were a few additional studies in the 1960's through the 1980's, none of which demonstrated that billboards were unsafe." (p. 11)
>
> "The national crash databases do not mention billboards in their list of driver distractions." (p. 14)

Findings that DBBs are "Safety Neutral."

The authors invented the term *safety neutral* (p. 10) to describe their conclusions about the impact of DBBs on driver distraction and performance. They state: "Although there are measurable changes in driver performance in the presence of digital billboards, in many cases these differences are on a par with those associated with everyday driving, such as the on-premise signs located at businesses" (p. 6). In other words, the authors say, because other roadside distractions such as their "comparison sites" (which, they note elsewhere, contained multiple signs, changeable message signs, and digital, flashing, and video displays) are also associated with difficulties in speed and lane maintenance and excessively long glances away from the forward roadway, DBBs should be considered *safety neutral* because their adverse effects on driver performance are similar to the effects from these other digital advertising signs..

The authors are able to reach this conclusion because of their intentional confounding of the DBB and comparison sites. The intentionality of this confound is demonstrated by the fact that the researchers had complete freedom to select the (50-mile long) study route and to choose the test sites anywhere along that route. That they chose "comparison sites" which often included digital signs, changeable message signs, and flashing and video signs, made it highly likely, even prior to data collection, that they would find similar results from these "control" sites and from the DBB sites, and that they would thus be unable to demonstrate whether the DBBs were more or less distracting to their participant drivers.

As expected, the researchers found quite similar driver performance and behaviors at these two types of sites, and these performance and behavior variables differed, in the critical area of eyeglance behaviors, from the two other types of sites studied (conventional billboards and baseline sites). The clear lesson, had the researchers chosen

to accept it, was that sites containing digital imagery with changing messages (whether on- or off-premise) were more demanding and more distracting than sites devoid of such sign characteristics. Yet, the authors took this obvious conclusion and twisted it in favor of their biases by reporting that DBBs were "safety neutral" because the adverse, and potentially unsafe, driver behaviors that they observed at such sites were generally similar to the behaviors that they observed at the comparison sites. This conclusion, accompanied by the authors' contrived term "safety neutral" seems to reflect obvious bias, and flies in the face of efforts to promote highway safety by reducing, not increasing, the number of irrelevant, distracting, roadside stimuli.

Correlation and causation.

Throughout the report, the authors confuse the terms *correlation* and *causation.* Although it is clear that they understand the important differences between these two types of statistical analysis, they often slip into the erroneous mode of citing a study whose sole purpose was to measure correlation, and criticize that study because it failed to prove causation. These fallacious comments are in line with a long tradition in the outdoor advertising industry of suggesting that there can be no relationship between billboards and traffic safety because billboards have never been shown to *cause* accidents.

Nighttime data collection.

Digital billboards are of particular concern to traffic safety experts at night, due to their ability to achieve high brightness and contrast levels, their high resolution imagery, and their visually compelling message changes, all of which can act to capture the attention of the driver at the expense of other targets in the visual scene (such as official signs and signals, pavement markings, and other vehicles). Because of the recent emphasis on the tails of the distribution in research studies and the long-standing practice of road safety considerations for the 85th (or higher) percentile, it is increasingly recommended to researchers that they examine the "high risk" or "worst case" scenarios in their studies, particularly when time, budget, or logistical constraints limit the number of participants. We question, therefore, why Lee and her colleagues chose to perform only a limited night-time study, one which included, *by design*, too few participants to enable the researchers to analyze their data statistically. This decision is particularly troubling because, as might have been hypothesized, the researchers found indications of greater distraction by digital billboards vs. control sites at night. In fact, unlike the daytime study, they found that all four of their eyeglance measures showed that DBBs and comparison sites were more distracting and attention-getting than the conventional billboard and baseline sites (pp. 64-66), and, they believed, at least some of these findings "would show statistical significance" in a larger study (p. 64).

SECTION 4.

HUMAN FACTORS ISSUES

As shown by the diversity of the published literature in this field, concerns about the potential impact of DBBs on road safety are based on a number of human factors concepts and principles. Much of the discussion about human factors issues is captured in the reviews of research and the development of, and recommendations for, guidelines and regulations of DBBs that appear in other Sections of this report. This section presents a brief overview of these key human factors issues.

- *Conspicuity* is often defined as the ability of a stimulus to stand out from its background. Traffic engineers want to ensure that official traffic control devices (signs, signals, and markings) are sufficiently conspicuous, day and night and in all weather conditions, that they communicate their message to the driver unambiguously, reliably, and in a timely manner. But the large size of roadside billboards (typically 14 ft by 48 ft), the placement of some such billboards close to, or directly within, the driver's line of sight, frequently changing messages and images that can appear to be flashing, and extremely high levels of illumination, tend to make such billboards highly conspicuous, particularly at night. As a result, the conspicuity of official traffic control devices and of other visual signals required for safe movement (e.g. vehicle reflectors, brake lights and turn signals as well as the vehicles themselves) may be reduced, with a consequential reduction of safety.

- *Distraction and inattention.* It is important to distinguish between these two terms, which are often confused. Inattention involves the failure of a driver to concentrate on the driving task for any reason, or for no known reason at all. It is distinguished from distraction in that it may have no known cause, and possibly no remediation. Conversely, distraction is a failure of concentration on the driving task that is a direct result of some activity or stimulus that triggers this failure to concentrate. Distraction may be due factors internal to the driver, such as fatigue, medication, illness, alcohol, or a focus on unrelated issues. It may be external to the driver but internal to the vehicle, such as mobile telephone use, adjusting the vehicle's controls or non-safety-related equipment (e.g. radio, navigation system, heating or air conditioning), conversations with passengers, or other non-driving related behaviors such as reading, grooming, or singing. Finally, distraction may be due to factors that are external to the vehicle, including vehicular, pedestrian or bicycle traffic, buildings, scenic vistas, roadside businesses, or advertising signs, including billboards. Whereas it may be impossible to control for the inattention that affects all drivers from time to time, many of the causes of distraction can be controlled.

- *Information processing*. One reason why official traffic control devices are designed as they are is to ensure that they meet certain basic human factors requirements. These requirements are described in the MUTCD, in Section 1A.02, as:

  A. Fulfill a need;
  B. Command attention;
  C. Convey a clear, simple meaning;
  D. Command respect from road users; and
  E. Give adequate time for proper response.

  The MUTCD implicitly recognizes that information contained on official signs will be ineffective, and thus, possibly ignored, if the message demands too much time or effort by the road user to read, understand, and act. To this end, the Manual specifies the language for standardized word messages on signs, prohibits the display of Internet addresses and recommends, for example, the avoidance of phone numbers with more than four characters. The only exceptions to this Standard and its associated guidance are for signs that are intended for viewing only by pedestrians, bicyclists, occupants of parked vehicles, and "drivers of vehicles on low-speed roadways where engineering judgment indicates that drivers can reasonably stop out of the traffic flow to read the message" (p. 2A-2). The requirements and guidance in this section of the Manual also apply specifically to Changeable Message Signs and to logo panels on specific service signs. The demands on a driver's information processing capabilities are addressed in the MUTCD, not only for the content of individual signs, but for the placement and spacing of signs as well. For example, the manual recommends that signs should be located only on the right side of the roadway (with certain exceptions) "where they are easily recognized and understood by road users" (p. 2A-8), and, because of increases in traffic volumes, a priority for sign installation locations should be established. Such a priority suggests that regulatory and warning signs whose location is critical, should be displayed in preference to guide signs where conflicts may occur. Less critical information, such as that on guide signs, should be moved to less critical locations or omitted, because "overloading road users with too much information is not desirable" (p. 2A-11). The Manual also requires that signs requiring different decisions by road users "be spaced sufficiently far apart for the required decisions to be made reasonably safely" (p. 2A-8), and recommends that, with specific exceptions, signs should be individually located on separate posts or mountings. Yet billboards are often placed on the left side of the road, frequently are placed in close proximity to one another, often on the same mounting, are do not generally adhere to good human factors practice that suggests restrictions to the amount of information conveyed on the sign.

- The *Zeigarnik Effect*. In 1927, Russian psychologist Bluma Zeigarnik demonstrated that tasks that have been initiated by humans but, for whatever

reason, interrupted before they could be completed, lead to feelings of anxiety and a desire to complete the task. In the years since the original demonstration of what we now call the Zeigarnik Effect, it has been shown that the discomfort related to task interruption has broad implications. For example, it is thought that it is this phenomenon that causes drivers to continue looking at the changing messages on DBBs o learn what comes next; and it is the basis of the technique used in advertising in which a complete message is "sequenced" across several different signs or multiple message changes of a single sign.

- *Brightness and glare*. Brightness is the subjective impression of the luminance of a sign, and glare is a physiological response. The majority of public complaints about DBBs concern their excessive brightness, particularly at night, to the extent that they become the most conspicuous item in the visual field, and draw the eye away from other objects that need to be seen. The photograph shown in Figure 5 was taken by the author of a DBB from a distance of six miles. The photograph was taken at 7:52 AM, and has not been altered in any way.

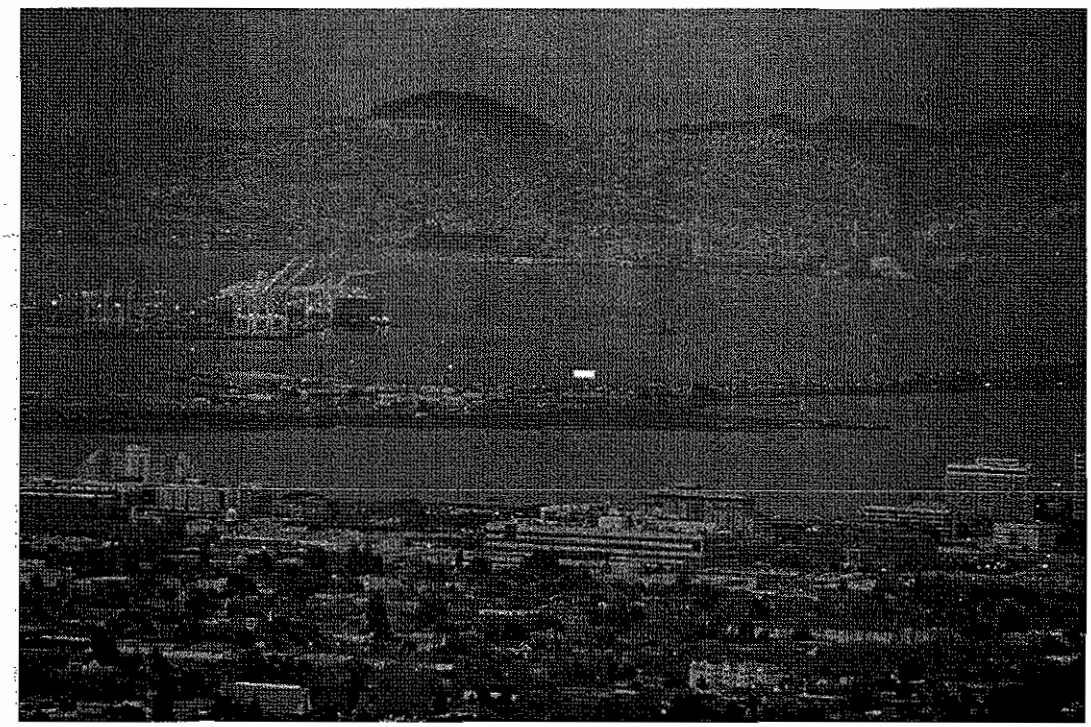


Figure 5. Unaltered photograph of a DBB from a distance of six miles

- *Legibility and readability*. Signs, to efficiently communicate a message, must be legible and readable. Specific design characteristics of official traffic signs such as font, letter size, color and contrast between figure and background, etc., have been specifically selected and mandated after years of empirical

testing to be optimized for legibility and readability under all conditions so that they can communicate their messages quickly and unambiguously. As one example among many, the MUTCD suggests that "word messages should be as brief as possible and the lettering should be large enough to provide the necessary legibility distance. A minimum specific ratio, such as 25 mm (1 in) of letter height per 12 m (40 ft) of legibility distance, should be used" (p. 2A-7). Conversely, billboards may display no such properties. Instead, they tend to exploit the same human factors characteristics discussed above to ensure that the signs take more time to read, demand multiple glances to communicate the intended message, etc. Indeed, billboards often mix multiple font designs and sizes, multiple colors of figure as well as background, even text written sideways or upside down on the sign, to achieve an impact that is quite the opposite of that for which official signs strive.

- *Novelty*. In human factors, it is known that a novel stimulus, one that a driver has not encountered previously, is likely to capture attention and lead to a response merely because of its novelty. Hence, when new safety treatments are applied to the roadside environment, the research that is performed to test the effectiveness of such treatments is typically postponed until the "novelty effect" has passed. When traditional, static billboards display the same message to drivers for weeks or months at a time, it is widely believed that drivers begin to ignore the signs. However, DBBs present a new and different image every few seconds, and because such images can be immediately downloaded to such signs from remote locations, the signs have the capability of presenting a unique, novel image and message to a driver every time the sign is approached.

- *Sign Design, Coding, Redundancy*. As discussed above, the key design features of official traffic control devices include size, shape, color, composition, lighting (or retroreflection), contrast, legibility, and simplicity and reasonableness of message. These features are intended to be used, in varying combinations, to draw attention to the devices, to produce a clear meaning, to permit adequate time for response, and to command respect from the road user. TCDs are designed to be uniform, unmistakable, placed and operated uniformly and consistently, and removed if they are unnecessary. "Uniformity of devices simplifies the task of the road user because it aids in recognition and understanding, thereby reducing perception/reaction time" (p. 1A-2). DBBs, on the other hand, follow none of these principles of uniformity or consistency.

- *Visual attention*. Our attention may be drawn to, or captured by, an object such as a billboard either because we make a conscious effort to attend to it ("top down") or because some characteristic of the object (e.g. size, placement, brightness, etc.) captures our attention without volitional intent ("bottom up"). The first type of visual attention is also referred to as "search conspicuity," whereas the second is known as "attention conspicuity." Road

and traffic safety experts take advantage of bottom up visual attention capture by: employing unique colors for traffic control devices when challenging conditions are present (e.g. the use of orange for construction and work zones), outfitting emergency response vehicles with flashing lights and sirens, and by using flashing beacons and/or flashing messages on road signs when urgent safety warnings must be communicated. DBBs, more than any previous technology used for roadside advertising, are capable of commanding drivers' attention by employing extremely high luminance levels, bright, rich colors, and a pattern of message display that may appear to flash.[12]

- *Positive Guidance*. Positive Guidance is an analytical tool developed by FHWA in the early 1970s based upon the pioneering work of Alexander and Lunenfeld (1972). The tool is based on the premise that drivers can be given sufficient information about road hazards when and where they need it, and in a form that they can use to enable them to avoid error that might result in a crash. The tool integrates knowledge from both human factors and highway engineering to produce an information system that is matched both to the characteristics of specific roadway locations and the capabilities of drivers. Alexander and Lunenfeld developed operational definitions of the driving task and driver "expectancy," the primacy of needed information and the manner in which that information should be presented, the concept of decision sight distance, and the consequences of system failure. The Positive Guidance tool has been used, nation-wide and internationally, for more than 30 years.

- *The Moth Effect*. Green (2006) reviewed research that suggests that there is a "moth effect" that may cause drivers to not only look in the direction of a bright light source on the side of the road, but inadvertently steer in that direction as well. Perhaps more appropriately seen as a variant of the physiological mechanisms of phototropism or phototaxis, in which the eye is drawn to the brightest objects in the field of view, the moth effect has been described by some as causing crashes as a result of a driver's loss of lane maintenance due to a combination of reduced optic flow and an "intense attentional fixation on a roadside target" (p. 18).

---

[12] For more than 25 years, a debate has raged between the outdoor advertising industry and the road and traffic safety community over the issue of whether changeable message billboards present "flashing" messages. Most regulatory documents, throughout the U.S. and abroad, specifically prohibit signs that use flashing lights or messages. And the billboard industry has routinely defended DBB technology by stating that such signs do not flash. The MUTCD defines "flashing" as "an operation in which a signal indication is turned on and off repetitively" (p. 1A-11). The U.S. Coast Guard publishes a "Light List" (USCG, 2006) in which it describes different "characteristics of lights" used in lighthouses and lighted buoys. Two of these light characteristics could be used to define the operation of most DBBs. An "alternating" light is one which shows different colors alternately; an "occulting" light is one "in which the total duration of light in a period is longer than the total duration of darkness and the intervals of darkness (eclipses) are usually of equal duration." Note that the duration of a displayed image and the duration of any dark or blank display between successive images, is not considered in any of these three definitions. Accordingly, if one were to apply any of these technical definitions rather than a more common dictionary definition DBBs would likely be classified as flashing signs.

SECTION 5.

CURRENT AND PROPOSED GUIDELINES AND REGULATIONS

In Section 2 of this report we reviewed recent research about the safety aspects of digital billboards prepared by authors in six countries in addition to the United States. It is instructive to note that, of these countries in which the greatest amount of research has been conducted, we are aware of five of them have developed and implemented guidelines under which such signs may be placed and operated. In addition, many States and local jurisdictions in the US have promulgated guidelines or regulations of their own, or have issued moratoria under which they will evaluate proposed guidance or regulations.

Below we have attempted to cite and explain all of the guidelines and/or regulations that we have found in countries outside the US. Because of the large and growing number of such regulatory documents in cities and counties in the US, however (we understand, for example, that 45 cities and counties in Texas alone have issued or are currently considering regulations on the control or prohibition of DBBs [Lloyd, 2008]), it is possible only to report on representative examples and, for these, to summarize only their most salient sections.

International Guidelines and Regulations

Queensland, Australia

Of all of the policy documents reviewed for this report, the most comprehensive was that prepared by the Traffic Engineering and Road Safety section of the Queensland (Australia) Government's Department of Main Roads. The purpose of this "Guide to the Management of Roadside Advertising" (TERS, 2002) is to assist the Department of Main Roads and local government agencies in their evaluation of proposals for roadside advertising, to assist in the development of roadside advertising management plans, and to provide information to advertisers to enable them to achieve their goals with a minimal adverse effect on traffic safety and movement.

Unique to the TERS document are a number of operational definitions that serve as a basis for the analysis which resulted in the guidelines and regulations promulgated. For example, four categories of roadside advertising are defined in the report. Given our focus on DBBs, we are concerned only with category 1, which includes "large free-standing devices" such as billboards and trivision signs.

Other key definitions include:

> Advertisements are considered to *directly distract* drivers if they convey information that is contrary to or in competition with information conveyed by *important official traffic control devices.*
>
> *Important official traffic control devices* are major regulatory, warning, or guide signs. For example, an initial regulatory speed sign is considered important, whereas repeater signs are not. The decision as to whether specific TCDs are or are not important is to be made by Main Roads district officers.
>
> Advertisements should not distract drivers in the proximity of *designated traffic situations,* such as "areas in which merging, diverging and weaving traffic maneuvers take place, 'open' railway level crossings, road intersection driver decision-making points in the vicinity of important official traffic signs, and reading and interpreting official traffic signs" (p. C-2).

Appendix C to the document, titled "Driver Distraction Potential," provides a specific and comprehensive series of flow charts (decision trees) and tables that enable an inspector to determine exactly what types and operational characteristics of advertising signs are permissible under different road and speed conditions. The identification of driver distraction potential and the resultant regulations is based on extensive human factors research, experience, and engineering judgment. The stated goal of these regulations is "to ensure that a high level of safety for the road user is maintained by managing competition for drivers' attention in locations where driving demands are great or where the road authority needs to convey important information to motorists on official traffic signs" (p. C-2).

Different categories of roads are described, with correspondingly different restrictions on advertising signage. For advertising devices beyond the right-of-way but visible from "motorways, freeways, or roads of similar standard," only non-illuminated signs or non-rotating static illuminated signs are permitted (p. 6-4). Where an advertising device is permitted on State-controlled roads, the same restrictions apply. Further, "variable message signs and trivision signs are not permitted on State-controlled roads" (p. 6-5). For those advertising devices that are permitted, a clear chart is provided (labeled Figure C6) that provides graphic depictions of the "device restriction area" (p. C-12).

In Australia, official signs are placed in accordance with a specific methodology described in the Austroads Guide to Traffic Engineering (AUSTROADS, 1988) which takes into account travel speed, sign content, and legend height. Accordingly, the TERS report identifies "longitudinal exclusion zones," roadside areas in the vicinity of official TCDs in which advertising devices are not permitted. The length of these exclusion zones is typically 1.2v on local streets, and 2.5v on multi-lane freeways (where v = speed), and increases to 5.0v in advance of on-ramps and 7.5v in advance of exit ramps. The report provides specific justification for each recommendation, and that given for ramps is typical:

> Estimating the speed of entering traffic on a high speed road is a complex task which requires a fair amount of preview free from extraneous information. The 5V requirement will provide a motorist travelling at 100 km/h with 18 seconds preview time in which to identify an on-ramp and change lanes if necessary. The downstream 2.5V separation distance allows for traffic to stabilize following the merge (p. C-3).

Although not every description is quite so comprehensive, the reader can, nonetheless, understand both the guidelines proposed and the rationale for them.

Sign brightness is discussed in detail in Appendix D, and the rationale for the development of guidelines is based, in part, on the work of Johnson and Cole (1976) who reported that "brightness from illuminated Advertising Devices directed at road traffic should be minimized under all conditions" (p. 20, reported in TERS, 2002).

The authors provide a clear distinction between two often confused key terms - luminance and brightness. Luminance is described as a characteristic of the advertising device itself that is independent of the environment in the vicinity of the sign. Luminance levels may vary across the face of the sign and the direction from which the sign is viewed. It is at a maximum when viewed from a direct frontal position, and falls off (diminishes) as the viewing angle becomes more oblique. Brightness, on the other hand, is a visual sensation experienced by the observer, which is affected by the sign's luminance (and the uniformity of that luminance across the sign face), as well as by its size, contrast, the viewing position of the observer, and characteristics of the observer him/herself (such as the effect of phototropism [the involuntary movement of the eye toward the brightest points in the field of view]). Since brightness is a subjective value, it cannot serve as a basis for regulation.

The report identifies three different "Lighting Environment Zones," and Table D1 identifies the maximum average sign luminance permitted in each zone for advertising signs visible from State-controlled roads. The authors state that the maximum levels were established following field investigations in two different areas of the State.

These maximum permitted luminance levels are

> In Lighting Environment Zone 1, 500 cd/m^2
> In Lighting Environment Zone 2, 350 cd/m^2
> In Lighting Environment Zone 3, 300 cd/m^2

for advertising signs of all sizes. Zone 1 is defined as an area with generally very high off-street ambient lighting such as central city locations. Zone 2 means an area with generally medium-high off-street ambient lighting such as major suburban business centers, entertainment districts, and industrial and/or community centers (which may include, for example, large gasoline service stations, parking lots or garages, etc.). Zone 3 is defined as an area with generally low levels of off-street ambient lighting, such as rural and residential areas.

TERS provides a specific methodology for the measurement of luminance against this standard. This methodology is summarized in Section 6 of the present report.

In addressing the characteristics of billboards that may be permitted, the report considers three different location categories:

1. Advertising outside the boundaries of, but visible from, State-controlled roads (except motorways),
2. Advertising visible from motorways, and
3. Advertising within the boundaries of State-controlled roads.

In Category 1, TERS provides an extensive discussion of DBBs, which it refers to as "electronic displays." It states: "Because electronic displays are conspicuous by design and have the greatest potential to distract motorists, the objective is to limit this potential" (p. 6-3). To achieve this objective, TERS requires that such signs may be installed only where:

- There is adequate advanced visibility to read the sign;
- The environment is free from driver distraction points and there is no competition with official signs
- The speed limit is 80km/h or less
- The device is not a moving sign (defined elsewhere in the document)

TERS further describes acceptable characteristics for signs that display predominantly graphics, with or without text:

- Long duration display periods are preferred in order to minimize driver distraction and reduce the amount of perceived movement. Each screen should have a minimum display period of 8 seconds.
- The time taken for consecutive displays to change should be within 0.1 seconds
- The complete screen display should change instantly
- Sequential message sets are not permitted
- The time limits will be reviewed periodically

Finally, TERS addresses DBBs that contain only text, as follows:

- The number of sequential messages … may range from one to a maximum of three; in locations with high traffic volume or a high demand on driver concentration, the number of sequential messages should be limited to two.
- Where a display is part of a sequential message set, the display duration should be between 2.5 to 3.5 seconds for a corresponding message length of three to six familiar words.
- The number and complexity of words used … should be consistent with the display duration.
- The time taken for consecutive displays to change should be within 0.1 seconds.

- The complete screen display should change instantaneously.
- In a text-only display, the background color should be uniform and non-conspicuous.

Advertising Devices beyond the boundaries of, but visible from motorways "are limited to non-rotating static illuminated and non-rotating non-illuminated formats" (p. 6-4). In other words, TERS does not permit changeable message signs, flashing signs, or DBBs of any type if such devices would be visible by motorists traveling on motorways. In addition, no advertising signs of any type (including those that are static, whether illuminated or not) are permitted within the restriction distances discussed above. TERS states: "In addition to the restriction areas … further restrictions may apply where Main Roads demonstrates that the traffic conditions require additional driver attention and decision making" (p. 6-4).

Finally, where advertising devices are permitted within the boundaries of State-controlled roads, such signs must be non-rotating static illuminated and non-rotating non-illuminated signs. Neither variable-message signs nor trivision signs are permitted on State-controlled roads.

It is with regard to the flash rate permitted for advertising signs that the TERs report differs most significantly from the prevailing guidance and regulations in the US. The authors explain that flashing illuminated advertising signs have the potential to distract drivers, and that the effects of such flashing signs are described by the *Broca Sulzer Effect* and the *Bartley Effect*. The former states that, at high luminance levels, the momentary luminosity shortly after the onset of a flash appears higher than the luminosity of a steady light of the same luminance. The latter states that, if a light is repetitively flashed, for example between four and ten times per second, the apparent brilliance of the light increases by as much as four to five times the actual luminance.

As a result of their understanding of these two phenomena, the TERS report permits a maximum flash rate of two flashes per second for devices visible from State-controlled roads in Lighting Environment Zones 1 and 2, but prohibits any flashing lights on advertising devices visible to motorists on State-controlled roads in Lighting Environment Zone 3. Flashing signs, or signs with flashing lights, are not permitted within the boundaries of State-controlled roads, nor within or outside the boundaries of motorways, freeways, or roads of similar character if they would be visible to motorists traveling on such roads.

In light of recent proposals from the States of California (Kempton, 2008) and Nevada (Martinovich, 2008) to consider public-private partnerships that might result in advertising on State-controlled roads, the TERS report provides useful guidance for "advertising devices provided as part of sponsorship arrangements" (Appendix A). The report describes a program in which "the Department may permit the erection of Advertising Devices for a defined period in exchange for … private sector sponsorship of road infrastructure and/or works (p. A-2). Examples of such projects include construction of a pedestrian footbridge over the roadway, roadside landscaping and tree planting, and

rubbish removal including removal of illegal Advertising Devices. Project sponsorship must be based on full and open competition, and the project must be warranted in its own right. For sponsorship of "major infrastructure such as pedestrian overpasses," the Department may permit: "third party advertising on the sponsored structure, on free standing advertising devices, or on existing overhead transport structures within the vicinity of the sponsored infrastructure;" in the case of roadside cleaning and/or landscaping, the Department may permit: "the erection of signs, which contain the sponsor's corporate logo, designating the start and end of the sponsored section of road" (p. A-3). Graphic examples are provided which depict a fixed sign displaying a corporate name on a pedestrian overpass, and four examples of signs depicting sponsorship of cleaning or landscaping projects, which are quite similar to FHWA's "acknowledgement signs" (D-14-1, 2 and 3) proposed for the next edition of the MUTCD (Capka, 2005).

The TERS document has also anticipated the growing use of vehicle-based advertising. Traffic Regulation 1962 s. 126 states, in part: "A person shall not, in respect of a vehicle on which or alongside of which an advertisement is being displayed – drive, or permit to be driven, that vehicle on a road or cause or permit that vehicle to stop on a road in such circumstances that the primary purpose for which the vehicle is being driven or stopped at the material time is business advertising, unless the person is the holder of a permit issued by (the Government)" (p. 3-4, 3-5).

In an effort to minimize driver distraction from billboards which contain lengthy or difficult to read messages, TERS suggests that designers of Advertising Devices consider the relationship between legend height, sign content (i.e. number of words) and speed environment that are used in the design of worded traffic signs and that are contained in the AUSTROADS document. TERS states that the applicant's use of such design guidance "may, in certain circumstances, be considered by the Department in the assessment process" (p. 5-7).

South Africa.

Of the guidelines and regulations identified for the control of outdoor advertising for this report, we found those in South Africa to be quite comprehensive, specific, and, perhaps, the most unusual. Based on a review of practice elsewhere, and reliant to a considerable extent on the work of du Toit and Coetzee (2001) and Coetzee (Undated), the South African National Roads Agency Limited (SANRAL) first issued its "Regulations on Advertising On or Visible From National Roads, 2000" (SANRAL, 2000) to deal with on-premise as well as billboard advertising, and included specific components that address DBBs. The regulations were first issued in July 2000, and were updated and re-promulgated in December of the same year.

SANRAL's terminology is somewhat different than that in the US, and it is important to understand these differences to ensure that the regulations are not misinterpreted. A "billboard," for example, may include "variable messages," and an "electronic billboard" has an "electronically controlled, illuminated display surface which allows all or a portion of the advertisement to be changed, animated or illuminated in different ways"

(p. 4). The term "animated" is used to mean that "the visibility or message of an advertisement is enhanced by means of moving units, flashing lights or similar devices, or that an advertisement contains a variable message" (p. 3) The regulations also distinguish "small" from "large" billboards. For both fixed and electronic displays, any billboard that exceeds 18 square meters in area is considered large. Thus, the majority of roadside billboards in the US would meet SANRAL's criterion for large (a typical US roadside billboard measures 14 ft x 48 ft, or 672 sq. ft, approximately 62.4 sq. meters. South Africa uses the term "road reserve" to mean essentially the same as "right-of-way" in the US.

Part B of the regulations contains provisions that are applicable to all advertisements. Section 6, Subsection 1 of this Part (excerpted below) identifies outright prohibitions on the grounds of "road safety and traffic considerations" by stating that no advertisement may:

- Be so placed as to distract, or contain an element that distracts, the attention of drivers of vehicles in a manner likely to lead to unsafe driving conditions
- Be illuminated to the extent that it causes discomfort to or inhibits the vision of approaching pedestrians or drivers of vehicles
- Be attached to traffic signs, combined with traffic signs, … obscure traffic signs, create confusion with traffic signs, interfere with the functioning of traffic signs, or create road safety hazards
- Obscure the view of pedestrians or drivers, or obscure road or rail vehicles and road, railway or sidewalk features such as junctions, bends, and changes in width
- Be erected in the vicinity of signalized intersections which display the colours red, yellow or green if such colours will constitute a road safety hazard
- Have light sources that are visible to vehicles traveling in either direction (p. 12).

Subsection 2 provides guidance for the reviewing agency to use when reviewing applications for advertisements that will face a national road. The Agency must consider each of the following 13 points to determine whether:

- The size of the advertisement, together with other advertisements in the area, if any, will affect the conspicuousness of road traffic signs by virtue of potential visual clutter
- the size of the advertisement, or any portion thereof by way of its colours, letter size, symbol, logo, graphics or illumination, will result in the advertisement having a distracting effect on the attention of drivers of vehicles to the task of driving and lead to unsafe driving conditions
- the number of road traffic signs and advertisements in any area constitute a driving hazard, due to the attention of drivers of vehicles being deviated from the task of driving and leading to unsafe driving conditions
- the colour, or combination of colours, contained in the advertisement correspond with the colours or combinations of colours specified for road

traffic signs in the regulations promulgated under the National Road Traffic Act

- the speed limit, and the measure of the traffic's adherence thereto, the traffic volume, the average following headway and accident history of the road demand more stringent control of outdoor advertising
- the amount of information contained in the advertisement, measured in bits, is within prescribed limits
- the advertisement is suitably positioned and orientated
- the position of the advertisement will negatively affect the visibility of, sight distance to or efficiency of any road traffic sign, or series of such signs
- the advertisement could be mistaken to represent a road traffic sign
- the illumination of advertisements is likely to distract drivers' attention from road traffic signs which are not illuminated
- the position of an advertisement would disrupt the flow of information from road traffic signs to drivers who encounter a series of road traffic signs intended for traffic regulation, warning or guidance, in cases where the applicable speed limit on the road exceeds 60 km per hour
- the position of any advertisement would potentially distract drivers' attention at places where traffic turns, negotiates curves, merges or diverges, or in the area of intersections or interchanges, or where drivers' uninterrupted attention to the driving task is important for road safety
- The distance of any advertisement before any road traffic sign, an advertisement's position in between road traffic signs or an advertisement's distance behind any road traffic sign is of such a nature as to distract a driver's attention from any road traffic sign (p. 12-13).

Many of these requirements and review criteria in the two categories discussed above are also used in other jurisdictions. In our opinion, some, including some of those in broad use, are somewhat vague and might be subject to differing interpretations. A third group category of SANRAL regulations, however, provides a unique and potentially useful approach to DBB guidance or regulation in the US. Specifically, those requirements that address the "flow of information from road traffic signs to drivers" and the "amount of information … measured in bits" contained within an advertisement have direct relevance to traffic safety and are firmly grounded in human factors research.

The Agency is given additional authority to "increase the minimum spacing between advertisements or place further restriction on the position, size and content of any advertisement it considers necessary, in the interest of road safety" (p. 13).

Where SANRAL's safety review criteria break new ground, however, is in two key areas that focus on the driver's information processing demands and limitations. Specifically, two of the review criteria above address the placement and content of the advertisement in terms of the amount (bits) of information contained on the sign, and the potential for the sign to cause disruption of the flow of information to the driver.

From a regulatory perspective these two evaluation criteria are unique. They are explained below.

Part B, Section 6, Subsection (f) requires that "the amount of information contained in the advertisement, measured in bits, is within prescribed limits" (p. 13). These limits are defined in Section 8, "Advertisement to be concise," which states, on page 14, that an advertisement visible from a national road must be concise and legible and comply with the following requirements:

> (a) No advertisement displaying a single message may exceed six bits of information in a visual zone and 10 bits on a road other than a freeway;
> (b) No combination sign, or any other advertisement displaying more than one advertisement or message, may contain more than six bits of information per enterprise, service or property, or per individual advertisement or message displayed on a combination sign;
> (c) Numbers longer than eight digits are not allowed;
> (d) A street number indicating specific premises must have a minimum size of 150 millimeters and a maximum size of 350 millimeters;
> (e) No message may be spread across more than one advertisement.

With the exception of item (d), which refers only to address numbers, and item (e), which relates to what we have called message sequencing and is discussed elsewhere in the present report, each of the requirements above impose an upper limit on the number and length of words, numbers, symbols, etc., that can be displayed on a roadside advertisement.

A "bit" of information is defined in Part A, Section 1 of the regulations as "the basic unit for measuring the length of advertising messages and may consist of letters, digits, symbols, logos, graphics, or abbreviations" (p. 4). Bits are operationally defined in accordance with the following table:

Information on Billboard	Number of bits
Words of up to 8 letters	1.0
Words of more than 8 letters	2.0
Numbers of up to 4 digits	0.5
Numbers of 5 to 8 digits	1.0
Symbol or abbreviation	0.5
Large logo and graphics	2.0

The term "bit," a contraction of the words binary digit, was first used in the 1930s in a paper describing information storage for early computers. In the decades since, it has also been widely used in the science of information processing and human cognition. A further discussion of the term "bit" is beyond the scope of this paper.

In addition to its regulatory control on the amount of information that can be displayed on billboards, SANRAL also controls the placement of billboards with regard to official signs, in a manner that goes beyond other Government agencies. Specifically, Regulation 6(2)(k) states:

> In considering applications for approval . . . the Agency must evaluate whether ... the position of an advertisement would disrupt the flow of information from road traffic signs to drivers who encounter a series of road traffic signs intended for traffic regulation, warning, or guidance. . . (p. 13).

In essence, this regulation recognizes that there are categories of official signs in which the information on two sequential signs was linked, and that this information link must not be disrupted. An example given by du Toit and Coetzee is the link between an advance warning sign at an interchange and the actual off ramp. Other examples might include advanced signs for changes in speed limit or for the presence of a Stop sign or traffic signal. Although the South African Road Traffic Signs Manual (SARTSM) recognizes that a 200 m spacing is between two sequential road signs for 120 km/h roads in general, it requires 360m as a minimum distance on such a road for a motorist to react to a warning or information sign in advance of an interchange where lane changes and weaving may be necessary. SANRAL determined that the presence of a billboard between the advanced (1km) interchange signs and the off ramp would reduce this distance below acceptable limits. As a result, the requirement was established that no billboards would be permitted between the 1km advance sign and the gore of the subsequent interchange. This would permit the motorist to safely read and react to the 500m off ramp sign. In addition, because a freeway road sign is typically readable at 200m before the sign, the regulations prohibit billboards closer than 1.2km upstream of the interchange. In short, no billboards are permitted within 1.2km of an interchange, thus preserving sufficient time for motorists to read and respond to advanced warning or information signs (located 1km in advance of the gore), and ensuring that the flow of information between the advanced sign and the actual interchange sign, whose function is linked, is not disrupted.

During their evaluation of the efficacy of the regulations, du Toit and Coetzee (2001) reviewed billboard applications for 248 signs. (Each face of a two-face sign counted as one). Of the 86.7% of the signs that were rejected, 40.8% (the largest category) were rejected for being too close to existing official road signs, 20% were rejected for disruption of the flow of information to the driver, and 7.5% were rejected because they were too close to a ramp gore.

Victoria, Australia.

The State of Victoria specifies a "ten-point road safety checklist" which describes conditions under which it may consider any roadside advertising to be a road safety hazard. These ten points, which are broadly in use elsewhere, defines an advertisement as a road safety hazard if it:

1. obstructs a driver's line of sight at an intersection, curve or point of egress from adjacent property
2. obstructs a drivers view of a traffic control device, or is likely to create a confusing or dominating background which might reduce the clarity or effectiveness of a traffic control device
3. could dazzle or distract drivers due to its size, design or colouring, or it being illuminated, reflective, animated or flashing
4. is at a location where particular concentration is required (e.g. high pedestrian volume intersection)
5. is likely to be mistaken for a traffic control device, for example, because it contains red, green, or yellow lighting, or has red circles, octagons, crosses or triangles, or arrows
6. requires close study from a moving or stationary vehicle in a location where the vehicle would be unprotected from passing traffic
7. invites drivers to turn where there is fast moving traffic or the sign is so close to the turning point that there is not time to signal and turn safely
8. is within 100 metres of a rural railway crossing
9. has insufficient clearance from vehicles on the carriageway
10. could mislead drivers or be mistaken as an instruction to drivers

As discussed by the Road Safety Committee of the Parliament of Victoria (2006), only one of the items in this checklist includes numerical criteria, "making the application of the other criteria wholly subjective" (p. 113).

Of greater specificity, and of more direct relevance to the current project, the State also includes "operational requirements for the installation of Variable Advertising Message Signs" (VicRoads, 2005, cited in Road Safety Committee (2006). These requirements state that such a sign must:

- Not display animated or moving images, or flashing or intermittent lights
- Not be brighter than 0.25 candela per square metre
- Remain unchanged for a minimum of 30 seconds
- Not be visible from a freeway
- Satisfy the ten point checklist

The regulations in place in Victoria are also based, to some extent, on the work of Cairney and Gunatillake (2000), who reviewed the literature and made recommendations for policy, on behalf of the Royal Automobile Club of Victoria (RACV).

New South Wales (NSW), Australia.

In its report for the Government of New South Wales, Transportation Environment Consultants (TEC, 1989) prepared a series of suggested guidelines for the control of roadside advertising signs located within the road reserve. The principal recommendations for electronic variable message signs on conventional roads and on freeways are shown in the table below:

Standard	Roadside – Urban	Roadside – Rural	Overpass	Freeways
Minimum message on-time	2 minutes	2 minutes	2 minutes	2 minutes
Minimum message off-time	2 minutes	2 minutes	2 minutes	2 minutes
Maximum Changeover time	<0.1 sec	<0.1 sec	<0.1 sec	<0.1 sec
Minimum distance to traffic signal	12 m	20 m	30m	NA
Minimum distance to lane drop, official traffic sign, ramp, merge	10m	15m	25m	150m
Minimum distance to another Advertising device	7m	10m	20m	150m

The TEC report also provided guidance for the maximum luminance levels of illuminated advertising devices; their recommendations were based on a report by the Public Lighting Engineers in the UK (1981, cited in TEC, 1989).

Four lighting zones were classified, generally as follows:

> Zone 1: areas with very high off-street ambient lighting, e.g. central city locations
> Zone 2: areas with medium-high off-street ambient lighting such as shopping/commercial/industrial/community centers, car sales yards, car parks, larger petrol stations, etc.
> Zone 3: areas with low-medium off-street ambient lighting, e.g. areas with rather isolated small shopping/commercial/industrial/community centres.
> Zone 4: areas with low levels of off-street ambient lighting; e.g. most rural areas, many residential areas.

For advertising signs with an illuminated area of more than 10 square meters, the maximum recommended lighting levels (expressed as cd/m^2), are 1200 in Zone 2, 800 in Zone 3, and 400 in Zone 4. There is no limit in Zone 1. Note that the most common billboard size in the US is 14 ft. x 48 ft., which, at 672 sq. ft. places US billboards into the largest sign category cited in these guidelines.

The Netherlands.

TNO was recently asked to develop guidelines and "decision criteria" to be used by the Dutch Ministry of Transport, for visual distracters that presented "non-driving related information" (Martens, 2009). Distracters to be considered might be any types of roadside objects, including, but not limited to, billboards. The guidelines were to be developed using existing human factors knowledge and principles (i.e. no new research was to be conducted). The guidelines will be initially applied to motorways, with later extension to other roads in The Netherlands.

The initial work has led to the following recommendations:

- There should be no information that actively attracts attention; this includes no moving objects, no LCD or LED screens, and no moving or changing pictures or images.

- Non-driving related information should not appear within the driver's central field-of-view (less than 10 deg from straight ahead). Based upon an assumption of 300m sight distance, traversed at +/- 9 sec, this results in a prohibition of such signs within 50m of the road edge. Any sign within that boundary must be "extremely simple" and no billboards are permitted.

- Assuming a 150m legibility distance, and a maximum permitted sign reading time of 4 sec (presuming multiple glances may be needed) the guidelines suggest that signs contain a maximum of five "items" (letters, numbers, symbols, etc.). This is based on application of the following "reading time formula:"

  $T = N/3 + 2$, where T = sign reading time, and N = number of items

- No distractions should be permitted at merges, exits and entrances, close to road signs or in curves (specific constraints will follow)

- No telephone numbers will be permitted

- No fluorescent colors are permitted

- No ambiguity is permitted

- No controversial information is permitted; examples include sex, violence, religion, nudity

- No mixture of real and fake words is permitted.

- Commercial signs must be 90 deg to the road to minimize head turning

- No signs will be permitted that mimic road signs in color or layout

The rules will be contained in a decision tree format, and specific rules will apply to different categories of roadside distracters, including such diverse features as: buildings, objects of art, wind turbines, information signs and safety campaigns, billboards and other advertisements, tunnels, bridges and walls, airfields, skydive centers and heli platforms. The guidelines are expected to be ready for field testing and validation by mid-2009. Once adopted, software will be developed that will simply take an inspector through the decision process.

Brazil.

Guerra and Braga (1998) address the need for guidance and regulation to control the use of advertising signs within the road reserve. The necessity for such action is brought about by a financial crisis that affects road infrastructure with consequential low levels of service, lack of maintenance, and high accident rates. The authors state that their aim is to assist public agencies since existing laws either do not adequately deal with this subject or prohibit advertising outright. They state: "if suitable regulation is not adopted advertising signs within the road reserve (ASWRR) might bring about undesirable consequences such as accidents" (p. 128). In other words, the authors believe that permitting advertising within the road reserve could raise much needed revenue, but express concern that such revenue should not come at the cost of traffic safety.

The authors review regulations and guidance in other countries, but focus on Brazil. They point out that some states (within Brazil) take no position on the issue, whereas others (such as Sao Paulo) explicitly prohibit ASWRR, and still others (e.g. Rio Grande de Sul) permit such advertising. They also discuss the conflict between regulations and practice, suggesting that advertising signs may be present in certain locations despite prohibitions on their use.

Guerra and Braga review existing advertising signs in Brazil, and point out a number of traffic safety concerns, including:

- Visual intrusion at complex junctions from back-lit signs
- Brightness of the advertising signs reduces the conspicuousness of traffic signals at night
- Confusion with traffic signs
- Lack of control over the predominant colors of the advertising signs
- Insufficient time for drivers to read messages on changeable message signs

The authors express particular concern with the message change interval for changeable message signs, noting that, for example, signs in Australia must have a minimum display time of 200 s at 60 km/h, an interval which is "100 times longer than the 2 s one finds in Rio" (p. 131). A related concern is the risk of the Zeigarnik Effect since a motorist traveling at 60 km/h with a sight distance to a sign of 200 m could see four distinct messages and four changes.

Based on earlier work by the senior author, Guerra and Braga propose a series of guidelines for ASWRR, in five categories:

- Physical protection of highways and road users
- Choice of display sites
- Physical characteristics of signs
- Characteristics of messages and images displayed
- Products being advertised

Of potential relevance for guidance or regulation in the U.S., the authors propose the following:

- Advertising signs should be located at a tangent to approaching drivers
- Advertising signs should be no closer than 1000 m from one another on the same side of the road, and no closer than 500 m from the nearest advertising sign on the opposite side of the road.
- The display time of each image on a variable message sign should be long enough to appear static to 95% of drivers approaching it at highway speed
- The message change interval should not exceed 2 s
- The displayed image should remain static from the moment it first appears until the moment it is changed
- No animation, flashing or moving lights should be allowed.
- No message or image that could be mistaken for a traffic control signal should be displayed.
- Messages should be simple and concise.

United States.

New York State.

On April 11, 2008 the New York Department of Transportation (NYDOT) issued for public comment a set of "proposed criteria for regulating off-premise changeable electronic variable message signs (CEVMS)" within the State (NYDOT, 2008a). The proposed criteria were developed "in consultation with the New York Division of the Federal Highway Administration (FHWA)," (Marocco, 2008a) and were based on the provisions of 17 NYCRR Part 150, including Part 150.8 (b). Sections of the proposed criteria that addressed issues of CEVMS lighting and illumination issues were based on a study performed by the Lighting Research Center of the Rensselaer Polytechnic Institute (RPI, 2008).

The proposed criteria were based on the State's position that, whereas "the premise of advertising to motorists conflicts directly with highway safety," the State's goal was to "minimize the effects posed by the unique attributes of (CEVMS)" which were described as having the ability to "constantly convey different information to motorists, thereby increasing driver curiosity; attract attention through their brightness; and attract attention through their temporal changes of light" (p. 1).

The proposed criteria included four key elements and a list of prohibited locations, each of which was presented with its underlying rationale. These are summarized below.

1. Minimum Message Duration of 62 Seconds. This value was based on the State's opinion that it would be best that no motorist be able to see more than one message change as he or she approached any particular CEVMS, while recognizing that the ideal circumstance of seeing *no* message change was impossible to achieve. Making simple calculations of typical billboard size, letter

height, and posted speed limits on State highways resulted in the conclusion that the average billboard would be legible[13] for 5,040 feet, a distance which could be traversed in 62 seconds.

2. Message Transition Time should be Instantaneous. Given that the State believes that the change of message is "one of the elements (that) can lead to motorist distraction, especially among older drivers" (p. 2), and given the capability of the technology, an instantaneous message change would minimize such distraction.

3. Minimum Spacing between CEVMS of 5,000 feet. Given the State's position that a message change may be unsafe because it contributes to distraction, it believes that motorists should not be able to view more than one CEVMS at a given time.

4. Maximum CEVMS Brightness of 5,000 cd/m^2 in Daylight and 280 cd/m^2 at Night. The State believes that CEVMS brightness can have two separate adverse impacts on drivers – that it attracts attention to the sign, and that it can compromise dark adaptation. Thus, it believes that CEVMS brightness should be limited such that the signs do not appear brighter to drivers than existing static billboards. The RPI Lighting Research Center (LRC) was engaged to perform comparison measurements of existing conventional billboards and CEVMS; in addition, the State reviewed publicly available billboard industry data as well as sign codes from numerous municipalities to arrive at its recommended maximum brightness levels.

5. Prohibited Locations. Citing studies by the University of North Carolina Highway Safety Research Center (UNC-HSRC) and the National Highway Traffic Safety Administration (NHTSA) the State summarizes the reported risks to drivers due to distraction or inattention occurring within three seconds prior to a crash or near-crash, and the elevated risk of distraction by objects or events outside the vehicle to drivers over age 65. Using such findings, and relying on proposed changes to the MUTCD for the placement of official changeable message signs (CMS), the State recommends that CEVMS be prohibited at the locations shown below, because these are locations that "already place high demands upon driver attention" (p. 4). These proposed prohibited locations include:

<u>Interstate and Controlled Access Highways</u>

Within 1,100 feet of:
- An interchange
- An at-grade intersection
- A toll plaza

[13] Using legibility distance as a criterion for message duration is a less stringent criterion than the use of visibility distance, given that, without sight obstructions, digital billboards may be visible for several miles.

- A signed curve
- A lane merge/weave area

Within 5,000 feet of:
- Another CEVMS
- An official traffic device that has changeable messages

Primary Highways

Within 1,100 feet of:
- An entrance to or exit from a controlled access highway
- A signed curve
- A lane merge/weave area

Within 5,000 feet of:
- Another CEVMS
- An official traffic device that has changeable messages

Although the State provided no specific citations to research other than the two studies mentioned above and the study by RPI that it commissioned, the criteria presented in the State's draft guidelines closely comport with the recommendations of others, and are based on reasonable underlying human factors assumptions.

On July 18, 2008, the State promulgated revised criteria (NYSDOT, 2008a), which it described as "less restrictive" than those of the draft proposed criteria in the areas of message duration, sign spacing, and prohibited locations. The State's letter transmitting the revised criteria indicates that FHWA concurred with the modifications (Marocco, 2008b).

Although the requirement for an instantaneous message transition and the maximum permitted CEVMS brightness levels did not change, the other requirements did, as follows:

1. Minimum message duration was reduced from 62 seconds to 6 seconds.
2. Minimum spacing requirements of 5,000 feet were deleted and replaced with the statement that "only one CEVMS sign face would be visible to the driver at one time on either side of the highway."
3. The comprehensive and specific list of prohibited locations for CEVMS was eliminated, and replaced with the following guidelines:

- CEVMS should not be located within an interchange.
- CEVMS should not be positioned at locations where the information load on drivers is already high because of guide signs and other types of information.

- CEVMS should not be located in areas where drivers frequently perform lane changing maneuvers in response to static guide sign information, or because of merging or weaving conditions.

City of San Antonio, Texas.

Although CEVMS are prohibited within San Antonio, the City promulgated a set of regulations for "off-premise digital signs" under a trial that will permit fifteen such sign permits to be issued for the City's evaluation. Although the regulations, contained at Section 28-125 of the City's sign code, contain restrictions on CEVMS that include provisions for sign conversion and eminent domain, the summary below addresses only those aspects of the code that address the possible safety and traffic flow implications of such signs. These include:

1. The dwell time (message duration) shall be at least ten (10) seconds.
2. The change interval shall be accomplished within one (1) second or less.
3. The sign shall contain a default mechanism that will freeze the sign in one position if a malfunction occurs.
4. The sign may not display light of "excessive intensity or brilliance", which, for a full color display is defined as a maximum intensity of 7,000 nits[14] during daytime and 2,500 nits at nighttime.
5. A sign applicant shall certify that the sign's light intensity has been factory pre-set not to exceed 7,000 nits, and that the intensity level is protected from end-user manipulation.
6. The sign shall not resemble a warning or danger signal or cause a driver to mistake the sign for such a signal.
7. Sign faces may have dimensions up to 300 square feet, or up to 672 square feet in accordance with specified conversion values (not included herein).
8. The sign must not resemble or simulate any lights or official signage used to control traffic in accordance with the MUTCD.
9. A sign must be equipped with both a dimmer control and a photocell which will automatically adjust the display intensity according to natural ambient light conditions.
10. A digital sign may not be within 2,000 feet of another off-premise digital sign facing the same traveled way, and an off-premise digital sign shall not be in a line of sight with another off-premise digital sign. (Spacing requirements in relation to other sign classifications are addressed elsewhere in the regulations).
11. Sign heights are addressed elsewhere in the regulations.
12. The city may require emergency information to be displayed, within the appropriate message rotation, on off-premise digital signs. Such information includes: "Amber Alert emergency information or emergency information regarding terrorist attacks, or natural disasters." Such emergency information messages are to remain in rotation according to the designated issuing agencies' protocols.

[14] The term "nits" is the accepted equivalent to the older term "candela per square meter," abbreviated as cd/m^2.

It was the city's stated intent to undertake an assessment of the effectiveness and efficacy of its regulations (Simpson, 2008) in a program lasting one year. The one-year pilot program ended on December 16, 2008. Recently, the city decided to extend the program through October 2009 (Sculley, 2009).

City of Flowery Branch, Georgia.

After a moratorium period, the Flowery Branch (Georgia) City Council, on June 4, 2008, amended Article 24 ("Signs") of its Zoning Ordinance (Ordinance No. 348-7) to define and regulate CEVMS. Based on its review of the literature (several articles were cited), the language of the ordinance, in Section 1, offered the City's rationale for its actions, described as its findings. Those findings read, in part:

> Changeable electronic variable message signs, (CEVMS) … have been shown to create possible threats to public safety. Such signs are erected for the purpose of trying to hold the attention of motorists by changing messages and pictures for short durations using a series of bright, colorful images produced mainly via LED (light emitting diode) technologies. Brightly lit signs that change messages every few seconds compel motorists to notice them, and they lure the attention of motorists away from what is happening on the road and onto the sign. Such signs pose safety threats because if they attract a motorist's attention, the motorist will look at the sign and not at the road. (CEVMS) are also a threat to public safety because of their brightness, making them visible from great distances. Due to their nature of brightness and changing displays, changeable electronic variable message signs are more distracting than signs which do not vary the message. … Unless otherwise regulated, such displays can be extremely bright since they are designed to be visible in bright sunlight and at night. Furthermore, the human eye is drawn to them far more strongly than to traditional illuminated signs. Such electronic LED displays can be seen from as far away as six-tenths of a mile, making them distracting. It takes a minimum of six seconds to comprehend the message on an electronic sign, which is three times the safe period for driver distraction.

The ordinance, in Section 24.33, "Changeable Electronic Variable Message Signs," includes commonly seen constraints regarding sign dimensions, separation, and location within zoning classifications. Further, the ordinance establishes permit requirements, and prohibits flashing signs or those with "variation of light intensity of an individual message," both of which it considers to constitute an "animated sign."

Aspects of the ordinance that are unique to CEVMS and of interest for the purpose of this report include the following:

Duration of Message – "Each multiple message shall remain fixed for at least the amount of time that would result in one (1) message per mile at the highest speed limit posted

within the 5000 feet approaching the sign for the road from which the sign is to be viewed."

Transition Time – "When a message is changed, it shall be accomplished in less than one-tenth ($1/10^{th}$) of a second and shall not use fading, swiping, or other animated transition methods."

Illumination and Brightness - "No such sign shall be illuminated at an intensity of greater than twelve (12) foot-candles or (sic) illumination, measured from the nearest point of any highway or public road. … All such signs shall be equipped with a dimmer control and a photo cell which shall constantly monitor ambient light conditions and adjust sign brightness accordingly."

Freeze of Display When Malfunction Occurs – "Such signs shall include a default designed to freeze a display in one still position if a malfunction occurs."

Sequencing of Messages Prohibited – "Using two or more successive screens to convey a message that will not fit on one (1) screen shall be prohibited."

City of Oakdale, Minnesota.

On June 10, 2008, the Oakdale City Council unanimously passed an amended sign ordinance that includes regulation of digital billboards within the city. This ordinance is codified in Article 19, Chapter 25 of the City of Oakdale Zoning Code, at Section 25-181 to 25-200. Digital billboards, which the Ordinance calls Electronic/Dynamic Display, are addressed in Section 25-185(b).

In 2007, the city had passed a one-year moratorium to study such signs and their safety issues, and to draft the revised ordinance.

After Clear Channel Outdoor had installed two digital billboards in Minnetonka, Minnesota without permission, the League of Minnesota Cities commissioned a research study from SRF Engineering. Based on the study results, which stated, in part: "billboards can tend to distract drivers, dynamic features contribute to the distraction, and even short distractions can increase the risk of accidents," and based on concerns by state troopers and police chiefs around the (Minneapolis-St. Paul) metro area that the signs were safety hazards (Zillmer, 2008), the city adopted the ordinance in July 2008.

As is common with many other billboard ordinances, this ordinance prohibits any DBB that, "by reason of position, shape, movement or color, interferes with the proper functioning of a traffic sign, signal, or which constitutes a traffic hazard."

To address concerns of excessive brightness, the ordinance sets a limit of 2,500 Nits during daylight ("between the hours of civil sunrise and civil sunset"), and 500 Nits at nighttime ("between the hours of civil sunset and civil sunrise"), measured from the face of the sign. In addition, signs must have installed ambient light monitors which adjust the

brightness of the sign based on (ambient) light conditions. Further, the sign must have a system that automatically shuts the sign off when the display "deteriorates, in any fashion, 5% or greater until the … sign has been repaired to its fully functional factory specifications." At the time of permit application, the sign owner is required to specify the lamp wattage and luminance level in Nits, and state that the sign will be operated in accordance with City Codes at all times.

With regard to message duration, imagery, and change interval, the ordinance requires that the minimum display duration shall be 60 seconds, that all messages shall contain only static images, and that the message change be instantaneous "without any special effects, through dissolve or fade transitions, or with the use of other subtle transitions that do not have the appearance of moving text or images" (Sec. 125-85(b)(3).

One uncommon feature of the Oakdale ordinance is the requirement that owners of DBBs must apply for an annual license to operate the signs. This contrasts with the situation in most jurisdictions where a permit is granted, and, once in place, exempts the sign owner from compliance with any future regulations or modifications to the ordinance that may be promulgated. The Oakdale city council took this unusual step because of the rapid changes in digital billboard technology, and to provide the city with the ability to respond to public concerns or new research that may become available. Zillow quoted Bob Streeter, the City's Community Development Director, as saying: "To operate a dynamic sign is not a right, it is a privilege. Because technology changes so fast, we want the ability to respond."

St. Croix County, Wisconsin.

The Sign Regulations of St. Croix County, issued on July 1, 2007 (St. Croix County Planning and Zoning Department, 2007) permit, with one exception, only static signs, for both on-premise and off-premise applications. Additionally, such permitted signs constitute a "customary use of signage" for reasons explained below.

Under the ordinance at §17.65 (C)(3)(f), signs with "external and uncolored" illumination are permitted. In addition to typical prohibitions against flashing, moving, traveling, or animated signs or sign elements, the following prohibitions apply to all signs with internal illumination:

- No illuminated off-premises sign which changes in color or intensity of artificial light at any time while the sign is illuminated shall be permitted.

- No illuminated on-premise sign which changes in color or intensity of artificial light at any time when the sign is illuminated shall be permitted, except one for which the changes are necessary for the purpose of correcting hour-and-minute, date, or temperature information.

- A sign that regularly or automatically ceases illumination for the purpose of causing the color or intensity to have changed when illumination resumes (are

prohibited)

- The scope of 3.f's prohibitions include, but are not limited to, any sign face that includes a video display, LED lights that change in color or intensity, 'digital ink,' and any other method or technology that causes the sign face to present a series of two or more images or displays.

The County's findings regarding "customary use" have been interpreted as causing "non-customary use" signs adjacent to federal-aid highways to violate the Highway Beautification Act, even if they are in a commercial or industrial zone, per 23USC§131(d): "Whenever a bona fide State, county, or local zoning authority has made a determination of customary use, such determination will be accepted in lieu of controls by agreement in the zoned commercial and industrial areas within the geographical jurisdiction of such authority."

Two uncommon but increasingly seen restrictions prohibit signs "which emit any odor, noise, or visible matter other than light" (§17.65B.6.a.8) and "A vehicle used as a sign or as the base for a sign where the primary purpose of the vehicle in that location is its use as a sign" (§17.65B.6.a.18).

St. Johns County, Florida.

On May 11, 1999, the Board of County Commissioners of St. Johns County passed Ordinance No. 99-35, a revised sign ordinance providing for the regulation of both billboards and on-premise signs within the County. Although much of the ordinance contains language quite similar to other ordinances examined for this report, including provisions for spacing requirements, two provisions of the ordinance are unusual, and of direct relevance to this project.

First, the ordinance defines, at Exhibit D, an "automatic changeable message device" as "any Sign which through a mechanical, solar, electrical or other power system is capable of delivering two or more various advertising messages which do, or appear to, rotate, change or move at any time in any way, including Tri-Vision, or any Multi-Prism Faces."

Under the ordinance's "General Requirements," Section 3E, "Movement," provides the following statement: "No Billboard shall be Erected, or any existing Billboard modified or operated, that incorporates Flashing, Scintillating, Beacon or Running lights, Animated Copy, or any Automatic Changeable Message Device."

Section XIV, Prohibited Signs, states: "The following signs are prohibited in the jurisdiction governed by this Ordinance and said prohibition shall supersede any conflicting provision of this or other County ordinances. Subsection 19 reads: "Automatic Changeable Message Devices" (p. 27).

Second, the ordinance places specific prohibitions on vehicle mounted advertising. "Signs on vehicles" are prohibited (Section XIV, Subsection 10, p. 26-27) with specific

exceptions such as those for parked vehicles not visible from the street, licensed or certified common carrier vehicles such as buses and taxicabs, vehicles temporarily traveling through the county, or vehicles on which signs are placed that identify the business or its principal product(s) if said vehicle is used during the operating hours of the business, provided that the vehicle is not repeatedly parked in a location where it serves as additional signage.

City of Tucson, Arizona.

By Ordinance Number 10481, the City of Tucson's revised sign code became effective January 14, 2008. While broadly reflecting sign codes in many other US jurisdictions, the Tucson code banned DBBs, signs on vehicles, and signs that provided other than visual stimulation. The relevant sections of the code are summarized below.

Section 3-53 is titled: "Prohibited signs enumerated." In addition to specific prohibitions against "intensely lighted signs" and those that are "animated by any means, including flashing, scintillating, blinking, or traveling lights, or any other means not providing constant illumination" (Sec. 3-53, §A.1, A.2), this section restricts Electronic Message Center signs, which it defines as:

> "An electronic or electronically controlled message board, where scrolling or moving copy changes are shown on the same message board or any sign which changes the text of its copy electronically or by electronic control more than once per hour" (Sec. 3-53, §B, p. 23).

Also prohibited in this section are any advertising signs or devices that emit "audible sound, odor, or visible matter" (§H, p. 23), and "signs mounted upon, painted upon, or otherwise erected on trucks, cars, boats, trailers or other motorized vehicles or equipment" (unless specifically allowed in another section of the ordinance) (§I, p. 23).

Billboards are addressed in Section 3-58. The relevant text reads:

> "Notwithstanding any other provision of the Tucson Sign Code, billboards may not change advertising copy by any type of electronic process or by use of vertical or horizontal rotating panels having two or more sides whereby advertising copy is changed by the rotation of one or more panels" (p. 26).

Outdoor Advertising Industry

The OAAA has, from time-to-time, posted certain guidelines for DBBs on its website or in documents distributed in other ways. As this is written, the organization makes available a publication titled "Regulating Digital Billboards" (OAAA, Undated a). In a section of the report titled "Suggested State Language" the document suggests that DBBs conform to the following:

- A displayed message appears for no less than four seconds

- The transition from one message to the next requires at least one second.
- Has spacing between billboards that are consistent with state requirements
- Does not include animated, flashing, scrolling, intermittent or video elements
- Will appropriately adjust display brightness as ambient light levels change

Others

During the course of preparing this Section of the present report, we became aware of a growing number of cities and other local jurisdictions that were addressing DBBs. Some were in the discussion stage, some had issued moratoria on new DBBs or DBB conversions while they considered the issues, some were conducting research, holding workshops or other public forums, and some were in various stages of developing or issuing guidelines or regulations. Despite our efforts to include in this report all of the new regulatory documents that we could find, this task became impossible, and we resorted to reviewing and summarizing a sample. To provide a frame of reference for the interest that DBBs have generated at the local policy level, the list below documents, from news media, the activities of city agencies within the State of Texas between April and December 2008 (Lloyd, 2008).

Cities enacting moratoria on LED billboards or DBBs in general – 6
Cities with DBBs under discussion at city council level -14
Cities imposing restrictions, but not prohibitions on LED billboards or DBBs - 2
Cities enacting total prohibitions on LED billboards or DBBs – 23

The Outdoor Advertising Association of America (OAAA, Undated b) has periodically issued and updated a document called the "State Changeable Message Chart." This document summarizes the regulations and guidelines in the various States as they affect "changeable message signs" including those with "tri-action" and those with "digital technology." Summarizing the information contained in this document, one can see that regulations for "dwell time" (the minimum length of time that a static message must appear on the sign before changing) range from 4 s to 10 s, those for "twirl time" (also known as the message change interval) range from "instantaneous" to a maximum of 4 s, with four States apparently having no upper limit; and required minimum spacing distance between signs ranging from "traditional 500 ft" to 5000 ft. According to the document, three states (North Dakota, New Hampshire, and Wyoming) prohibit all changeable message signs (CMS), five (Maryland, Massachusetts, Oregon, Texas, and Washington) permit tri-action signs only, and 38 others permit CMS with digital technology.

Recently, the OAAA (Undated c) posted on its website a list of "Brightness Criteria" for digital billboards, which, it noted, was based on a report submitted to the organization in March, 2008 by Dr. Ian Lewin of Scottsdale, Arizona. Our request for a copy of this report or the underlying analyses that led to the stated criteria was refused by OAAA on the grounds that the author did not want his data to be made publicly available since his had been submitted for publication.

Key provisions of the stated criteria are:

- Light produced by a digital billboard should not exceed 0.3 Footcandles (fc) over ambient light levels.
- Measurement should be taken utilizing a Footcandle (fc) meter from the following distances (perpendicular to the face of the digital billboard):
  - Posters: 150 feet
  - 10'6x36' Bulletins: 200 feet
  - 14'x48' Bulletins: 250 feet
  - 20'x60' Bulletins: 350 feet
- A digital billboard must be able to automatically adjust as ambient light levels change. An automatic light sensing device (such as a photocell or similar technology) should be utilized for adjusting the digital billboard's brightness.
- Sunset-sunrise tables and manual methods of controlling brightness are not acceptable as a primary means of controlling brightness.

SECTION 6.

RECOMMENDATONS FOR GUIDELINES

Based on the knowledge gained from the research reviewed in this project, as well as research conducted earlier and reviewed previously, good human factors practice, and guidelines or regulations developed or under consideration in jurisdictions throughout the US and world-wide, we have prepared a set of recommendations that State and local government agencies as well as private roadway operating authorities may wish to consider for use. We recognize that there are not yet comprehensive research-based answers to fully inform such guidance or regulation, and, given the complexity of the issue and the number of factors involved, it may be years before such results are available. Nonetheless, we have found, through the work undertaken for this project, that the research conducted within roughly the past ten years has quite consistently demonstrated empirical concern about driver distraction from roadside billboards, and has identified a number of DBB location and operational characteristics that seem to exacerbate the risk and/or consequences of such distraction, that the need for guidelines and/or regulations can be met within our current degree of knowledge. Indeed, of those research studies that have addressed driver distraction and roadside billboards, nearly every empirical study undertaken since 1995, including that by Lee et al., and sponsored by the outdoor advertising industry, have demonstrated that there is an adverse relationship between distraction and digital billboards.

MINIMUM MESSAGE DISPLAY DURATION (MESSAGE ON-TIME).

Perhaps the most contentious issue to be addressed in guidelines or regulations can be found in debates about the minimum duration of a message displayed on a DBB. For it is here that the goals of the DBB owner and those of the highway safety specialist are most at odds. Since roadside outdoor advertising is sold, to a large extent, on the number of drivers that pass the sign on a daily or hourly basis, and since certain times of day (e.g. rush hour) provide a larger audience, it is clearly to the sign operator's benefit to minimize the time for which any given message is presented so as to be able to offer more messages per unit time. There is, perhaps, a minimum display time below which both advertisers and regulators may agree that message display is unreasonable – for the advertiser because the time interval is too brief for a message to be read; for the traffic safety expert because the display obviously appears to "flash," and flashing signs are almost universally prohibited.

We are not aware of any research that has been conducted on the effects on distraction of the duration of time that a message on a DBB remains visible before changing to the next message. The OAAA (Undated a) has, periodically, issued guidance to its members on minimum display duration. It recommends 4 s. The FHWA (Shepherd, 2007) has recommended a minimum 8 s duration, and the OAAA (Undated b) reports that 41 States have enacted message display minima, ranging from 4 to 10 s. To our knowledge there is no empirical basis for any of these recommended or required display intervals. Indeed, as

discussed below, good human factors practice would suggest that minimum display duration should differ with sight distance, prevailing speeds, and other factors.

Without the benefit of research, we must rely on human factors principles when attempting to develop a meaningful standard for minimum message duration. There are two human factors concerns that help to inform the analysis for this issue. First, it is widely understood that bright lights and visual change can draw the eye to a stimulus that is brighter than the surroundings, and/or exhibits movement or apparent movement. DBBs possess these properties, particularly at night and when they can be seen from considerable distances. In addition, the Zeigarnik Effect suggests that drivers will be attracted to attend longer to a display whose message changes as they approach it, in an effort to "complete" the viewing experience; in other words, to be able to look at a changeable message sign until he or she has seen the "complete" message. The simple way to minimize both of these potentially distracting effects of DBBs is to reduce to a minimum the likelihood that any given driver will observe an actual message change or to see more than a single displayed image. Given that any driver may come upon a given DBB at the moment of message change, regardless of the message duration, this objective cannot be met. However, it is not unreasonable to place a lower limit on message display duration to ensure that it is highly likely that motorists will be unable to see more than two successive messages (which would, by definition, include one message change). This can be accomplished by determining the sight distance and the prevailing speed (or the posted speed limit) for a road on which such a DBB appears, calculating the time for which a given DBB will be within the view of approaching drivers, and setting the minimum message duration at that interval or greater. Several jurisdictions have adopted this approach (see, for example, TEC, 1989; TERS, 2007). This is also the approach that was followed by the New York State Department of Transportation during the development of its draft regulations (NYSDOT, 2008a). The result of this analysis in New York was a proposed requirement for a minimum message display time of 61 s. (This proposed requirement was substantially reduced after a public comment period [NYSDOT, 2008b]). Of course, for different sight distances and different prevailing speeds, this minimum message duration would be different. Although a case-by-case process of setting minimum display durations would be optimum for traffic safety, it is likely that for both regulatory and enforcement purposes and for the ability of sign owners to establish standardized display intervals (and, hence, standardized advertising rates), it would be more practical for a road authority to establish only a small number of display duration minima, based on roads within their jurisdiction that operate with different speed limits and traffic characteristics.

Recommendation.

It is recommended that the following formula be used for calculating a minimum acceptable DBB display duration:

Sight distance to the DBB (ft) / Speed Limit (ft/sec) = Minimum display duration (sec).

INTERVAL BETWEEN SUCCESSIVE DISPLAYS.

There is little disagreement between those roadway authorities which have promulgated guidance or regulations concerning the interval between successive displays. It is clear and consistent that this time interval should be as close to zero as possible. Some jurisdictions define the change interval as "instantaneous," others describe it as 0.1 s or less. The reason for this position is simple. Given that it is a combination of brightness and motion (real or apparent) that attracts a viewer's gaze to a DBB, a perceptible dark or blank interval between successive displays will increase the sense of apparent motion (i.e. bright-dark-bright is more visually compelling than bright-bright).

Recommendation:

Regardless of how it is operationally defined, the interval between successive displays should be essentially zero, such that an approaching driver cannot perceive any blanking of the display screen.

VISUAL EFFECTS BETWEEN SUCCESSIVE DISPLAYS.

Even more so than the case for the display interval, regulatory authorities are in complete agreement that there should be no visual "special effects" of any kind during the transition between successive messages. It is clear that the screen should transition from one message to the next with no perceptible dimming or blanking of the display, and with no visible effects such as fade, dissolve, or animation. Different jurisdictions have described such prohibited effects differently, but the purpose is the same – a seamless, imperceptible transition from one image to the next.

Recommendation.

No special visual effects of any kind should be permitted to accompany the transition between any two successive messages. (Of course, it is assumed that no special visual effects are permitted during the time that any message is displayed on the screen).

MESSAGE SEQUENCING.

Message sequencing is a term used to describe a single thought, idea, concept, message, or advertisement for a product or service that is divided into segments and presented over two or more successive display phases of a single DBB or across two or more individual DBBs. Like the old "Burma Shave" signs that lined the country's roadways beginning in the 1920s (Vossler, 1997), the use of roadside advertising signs to communicate a message in segments is based on the premise of capturing and holding the driver's attention throughout the time or distance chosen to present the complete message. This premise is, in turn, based on the understanding of the Zeigarnik Effect; or, as described in the Wikipedia entry, the signs were effective for "drawing the attention (of) passers-by who were curious to discover the punchline" (Wikipedia contributors, 2009).

We believe that sequencing should be prohibited, whether on a single sign or multiple signs. This can be effectively accomplished by establishing minimum longitudinal distances between DBBs, or by ensuring that the minimum message display time is sufficiently long that a driver cannot view more than two such messages on a given passage, or by a combination of both. Even more simply, restrictions can follow those promulgated by SANRAL, which state: succinctly: "no message may be spread across more than one advertisement" (SANRAL, 2000).

Recommendation.

Message sequencing should be prohibited.

AMOUNT OF INFORMATION DISPLAYED.

Other factors held constant, the more information that is presented on a DBB, the longer it will take an observer to read the message, and as shown in studies of official CMS, the more likely it will be that drivers will slow to read the message, adversely affecting traffic flow and safety. This concern is exacerbated in situations when a driver might want to memorize or memorialize part or all of a message displayed on a DBB. Dudek (2008), in discussing official CMSs using the latest LED technology, reports that about 85% of drivers can begin reading a message about 800 ft upstream of the sign if the sign uses character heights of 18 in. At a reading speed of one word per second (demonstrated in numerous studies), this translates to maximum message lengths of eight words at 55 mph, seven at 65 mph, and six at 70 mph (p. 9). One must keep in mind, however, that these message lengths assume a message optimized for legibility and readability. To the extent that message fonts, typefaces, colors, color contrast, and other factors detract from readability, these message lengths must be reduced.

To our knowledge, no US jurisdiction places restrictions on the amount of information that may be presented on billboards, including DBBs. As stated above, the amount of information on official traffic signs is controlled as a result of years of human factors research. Both the outdoor (OAAA) and on-premise sign industries (International Sign Association [ISA]) have, from time to time, provided guidance to their members about the relationship between the effectiveness of a sign and the amount of information presented on it.

Several government agencies outside the US have promulgated regulations or guidance that addresses this issue from the perspective of driver workload. Some limit the number of words or characters permitted on a sign; others restrict the number of bits of information that a sign may contain. Lengthy strings of numbers and/or letters, such as telephone or license plates numbers, or internet addresses, have come under scrutiny in a number of jurisdictions because of the demands that they may place on the driver.

There remains, however, a clear distinction between the efforts of highway and traffic safety experts on the one hand and the creators of outdoor advertising sign content on the

other, in the approach that they have followed to the design of messages meant to be read by drivers. The MUTCD and the research on which it relies recognize that road signs are something of a "necessary evil." They are required to communicate warnings, regulations, guidance and other information to road users. But, because even official signs draw the driver's eyes away from the principal task, such signs are designed communicate their message quickly, clearly, and consistently. Advertisers, on the other hand, have demonstrated little predilection to follow these principles; rather, their goal is to attract the driver's attention, and hold it long enough to communicate their message. For this reason, as well as others including brand identification and the need to compete with other signs for attention, billboards, including DBBs, tend to rely on bright colors, bold graphics, attention-getting images, and clever phrases to perform their job. Words and phrases may be presented anywhere on the sign face, including sideways and upside down, depicted in multiple fonts and typefaces that may be difficult and time-consuming to read. Color and contrast may draw attention to the sign and yet prove to be a challenge to the driver to read the message in the time available for it to be seen.

While it is not be within the power of any government agency or road operating authority in the US to dictate the type or nature of display content or presentation, we believe that it is reasonable for such authorities to impose limits on the amount of information that can be presented. Precedent for guidelines on information content can be found in the work of duToit and Coetzee (2001) in South Africa, Martens (2009) in The Netherlands, and Dudek (2008) in the US. The basis for such control as used on official signs is presented in the MUTCD (2003) at Section 2E.21 (p. 2E-20).

Recommendations.

Specific upper limits on the amount of information that might be permitted on DBBs should differ depending upon sight distance, speed limits (or prevailing speeds), and driver task demands imposed by the design and operation of the roadway. Without specific research it would be premature to recommend such limits in this report. However, reasonable guidance based on relevant human factors research, as discussed in Section 5 of the present report, has been developed by SANRAL (2000) and for the highway authorities in The Netherlands (Martens, 2009), and might prove to be a useful starting point for interested agencies. Further, the work by Dudek (2008) and his colleagues provides valuable insights, although this research is targeted at official CMS.

It should be noted that the use of telephone numbers, internet addresses, text message instructions, etc., is potentially harmful to traffic safety because drivers may slow to read, record, or even copy such information while in traffic. Evidence of such traffic slowing has been shown by Dudek, et al. (2007) with regard to AMBER Alert messages on official changeable message signs. Figure 6 shows a DBB displaying a commercial message that includes a number of these elements.

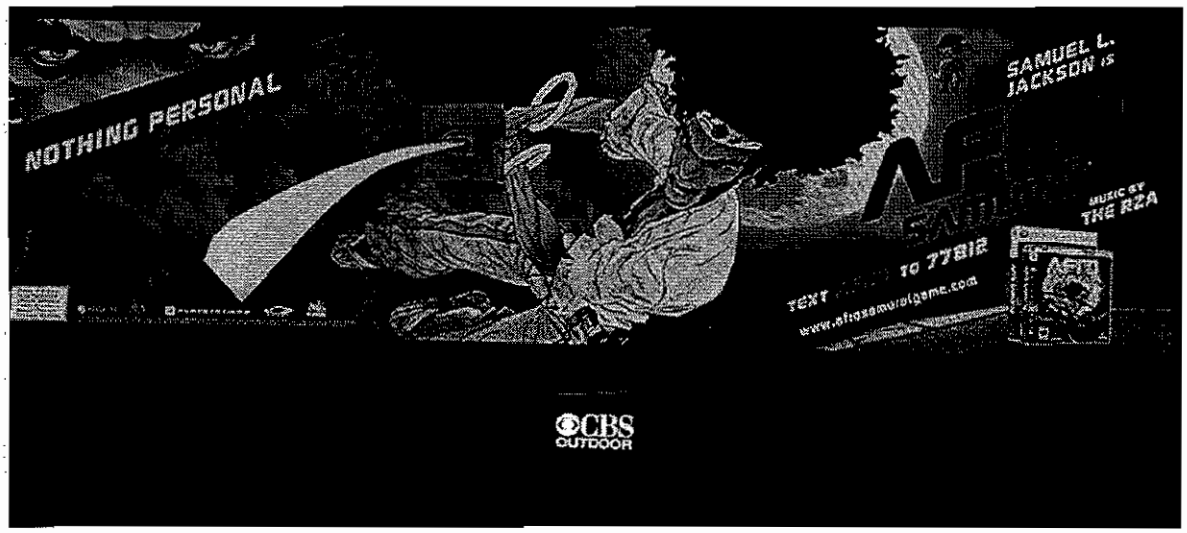


Figure 6. A DBB adjacent to an interstate highway in California. The sign includes an internet address, text messaging instructions, characters in multiple colors, sizes and typefaces, poor figure-ground contrast, and several graphic elements too small to read.

INFORMATION PRESENTATION.

As discussed immediately above, considerable research in both the US and abroad has produced clear and consistent recommendations for display presentation characteristics that facilitate speed and ease of reading and rapid, unambiguous message interpretation. These recommendations, through years of development and constant refinement have resulted in uniform standards for official signs. The lessons learned from this research, and the adoption of the spirit of such standards by the outdoor advertising industry could produce DBBs that facilitate rapid, error-free reading of roadside advertisements with lower levels of driver attentional demand and distraction. Typeface, font, color and contrast of figure and background, character size, etc., all play a role in the legibility and readability of a display. Figure 6, above, shows the potential difficulty of reading a message presented on a DBB with several display features that are less than optimum for readability by approaching drivers.

Recommendations.

Specific recommendations for the design of DBB advertisements are beyond the scope of this report, and, possibly, outside the authority of regulators. This is an area, however, where considerable guidance is available to advertisers and DBB owners from sources inside the outdoor advertising industry as well as human factors and traffic safety experts, and the MUTCD itself. Stronger industry guidance and self-regulation regarding the design of information presentation on DBBs could go a long way toward reducing their potential for driver distraction.

DBB Size.

The larger the size of the DBB, the larger the images and characters that can be displayed on it, the brighter it can appear to be, and the greater the distance from which it can be seen and read.

In the US, the majority of DBBs erected to date, and, to the best of our knowledge, the majority of those contemplated in the near term, are one-to-one replacements for, or the same size as, existing conventional billboards. The most common size for such billboards adjacent to roadways is 14 ft by 48 ft in a horizontal format.

Regulations governing DBB size may be based on factors other than sight distance or legibility, such as zoning, land use, structural constraints, etc., and are beyond the scope of this report.

On-premise and vehicle-mounted digital (and video) signs, do not necessarily conform to these standards. The issue of DBB size is this context is briefly discussed in Section 6.

Recommendations.

Since the principal focus of this report is off-premise DBBs, recommendations for maximum sign sizes are inappropriate.

BRIGHTNESS, LUMINANCE AND ILLUMINANCE.

The issue of brightness, luminance, and illuminance is at once the most contentious, the most important, the most "public," and the least well understood aspect of DBB operation and its potential for adverse impacts on approaching drivers. And yet, it is the issue that may be the most amendable to a solution that is satisfactory to DBB owners and operators, traffic safety experts and regulators, and the traveling public.

Brightness is a measure of the *perceived* intensity of a source of light. As described by Halsted (1993), "brightness is a subjective attribute of light to which humans assign a label between very dim and very bright (brilliant). Brightness is perceived, not measured... The response is non-linear and complex. The sensitivity of the eye decreases as the magnitude of the light increases" (p. 2). A DBB is constructed of thousands of Light Emitting Diodes (LEDs) that operate together to produce the myriad colors and levels of light that we see when we view such a sign. Thus, we may consider a DBB to be a source of light, although, in actuality, it is built of many individual sources. If we were to set a DBB to its maximum output and observe the sign in full sunlight, it would appear less bright to the human observer than it would if we viewed the same sign, at the same setting, at night. Similarly, if we viewed the sign at the same setting at night in a bright urban landscape it would appear less bright than if we viewed it in a dark rural environment. Accordingly, when trying to develop guidelines or requirements for the "brightness" of DBBs, what we really mean is that we need to establish objective, measurable limits on the amount of light that such billboards actually emit, and set different upper bounds for different environmental and ambient conditions. Such

conditions might include daylight in sun or clouds, dusk and dawn, adverse weather such as rain or fog, and nighttime conditions in urban, suburban, or rural settings. In short, "brightness" cannot be used as a criterion to regulate or provide guidance for the output of DBBs.

Whereas brightness measures the subjective, human perception of the DBB's intensity, two objective measures are available for the actual measurement and establishment of limits. *Illuminance* describes the amount of light coming from a light source that lands on a surface. Horizontal illuminance describes the amount of light landing on a horizontal surface, such as the light reaching the surface of a desk or table from a lighting fixture mounted overhead. Vertical illuminance describes the amount of light landing on a vertical surface. For example, a light shining on a wall, or a vehicle's headlights shining on a non-illuminated road sign. Illuminance is measured in *footcandles (fc)* or *lux (lx)*. *Luminance* describes the amount of light leaving a surface in a particular direction, or reflected off that surface, and can be thought of as the measured brightness of a surface as seen by the eye. Luminance is measured in *candelas per square meter (cd/m^2)*, also referred to as the *nits* (one nit = one candela per square meter). A typical LCD computer monitor, for example, has a luminance of 300 nits or higher.

We might think of illuminance as the lighting *of* an object, and luminance as the light coming *from* an object. In the case of a traditional, static billboard that is illuminated at night by floodlights, as well as in the case of a DBB which uses LED technology that is often described as "self-luminous," we are concerned with luminance, the light being emitted from the billboard rather than illuminance. Through a simple example, we can demonstrate how these two different measurement principles work, and why luminance is preferred for our application. If we shine a light onto a white wall, and shine the same light onto a dark grey wall from the same distance, the illuminance (the light falling on the wall) will be identical, but the luminance will be much lower for the grey wall, because it reflects back to the observer's eye much less of the light striking it.

Both the Illuminating Engineering Society of North America (IESNA) in its standard RP-19-01, and the Commission Internationale de L'Eclairage (CIE), in its publication 111-1994 (both cited in Andersen, 2008a), discuss luminance values for road signs – externally and internally lighted signs in the first case, and changeable message signs in the second. In its discussion of sign brightness, the 3M Corporation says: "luminance is the best measure available to judge relative sign brightness" (3M, 2005).

With an important exception discussed below, the luminance of a DBB is relatively unimportant during a sunny day. However, it is precisely because a DBB must have a very high luminance capability to be visible in bright sunlight, that its output must be reduced at night, at dawn or dusk, or in inclement weather.

Through what some have called the "moth effect" (see, for example, Green, 2006) but may be more appropriately seen as a variant of the physiological mechanisms of phototropism or phototaxis, the eye is drawn to the brightest objects in the field of view.

Thus, other things equal, a brighter billboard will attract a driver's gaze earlier and, potentially, longer, than other visual stimuli in the environment that appear less bright.

At night, dawn or dusk, or in inclement weather such as rain or fog, where visibility conditions are poorer than in daylight, a bright sign can draw attention away from the road, official TCDs, and other vehicles, and can render signs lighted to a lesser degree more difficult to discern, particularly when the billboard and the official signs must be viewed at the same time. Similarly, vehicle rear lighting can become more difficult to see, and less conspicuous, if it is to be viewed at the same time, and within the same field of view, as a brightly lit DBB.

There is no single luminance level that can be established as a reasonable criterion because brightness (although not actual luminance) is dependent upon the surrounding environment in the context of which a particular DBB is viewed. Thus, for example, a DBB of the same size and luminance will appear to the driver to be much brighter if it is located in a rural area or along an unlit roadway, than it would if it was in a brightly lit urban environment or adjacent to a illuminated freeway.

All of the research identified in this report, and all of the identified regulatory authorities that have imposed billboard, including DBB, brightness limits, use luminance as their measurement approach. On the other hand, the OAAA uses illuminance. The discussion below highlights these differences and explains the implications of them for the setting of regulations or guidance.

On behalf of the New York State Department of Transportation, the Lighting Research Center of the Rensselaer Polytechnic Institute (Bullough and Skinner, 2008) prepared a document titled: "Technical Memorandum: Evaluation of Billboard Sign Luminance." The principal purpose of RPI's work was to provide NYSDOT with estimates of the luminance levels of existing, static, externally-illuminated billboards adjacent to State highways so that the State could make an informed decision about maximum luminance levels that might be permitted for DBBs using "self-luminous light sources such as light-emitting diodes (LEDs)" (p. 1). The work consisted of three steps – a review of recommendations and methods to calculate luminances from IESNA and industry sources; field measurements of the luminances of several billboards in situ; and a computer simulation of a billboard lighting installation based on industry recommendations.

The report describes the IESNA recommendations (Rea, 2000) for "illuminated billboard signs and other large advertising panels" (i.e. the dedicated, fixed lighting shining on the billboard to illuminate it at night) and identifies two factors that must be considered when applying these values. The first is the degree of reflectivity of the billboard itself – a dark-colored sign will reflect less light than will a light-colored sign (assuming that the lighting sources are equal). The second is the surrounding location – whether the billboard is located in a bright, typically urban, setting, or in a dark, typically rural setting. The IESNA values for billboards in bright surroundings is 1000 lux (abbreviated lx), and for dark surroundings, 500 lx. Assuming that a billboard had a white sign face

with a reflectance of 0.8, the luminance (L) of such a billboard (the amount of light reflected back from the sign) would be 250 candela per square meter (cd/m^2) in the bright environment, and 130 cd/m^2 in the dark setting. The authors then reviewed product information supplied by two billboard manufacturers and concluded that industry recommendations were in close accord with those recommended by the IESNA.

The researchers then recorded the luminance values for six conventional billboard faces and four LED billboard faces using a Minolta LS-100 luminance meter. Their measurement methods are well described in their report and won't be repeated here. They found that the LED billboards ranged from 160-320 cd/m^2 at night, with a mean value of 225 cd/m^2. The conventional billboards (excluding two faces that were apparently not illuminated) ranged from 150-240 cd/m^2 with a mean of 182.5 cd/m^2.

Bullough and Skinner next created a computer simulation model to determine whether they could reproduce their field measurements. Their model consisted of a 14 ft. by 48 ft. fixed, illuminated billboard with a white (0.8 reflectance) sign face and a 40 ft. tall mounting pole with reflectance of 0.25. Their virtual billboard installation was created in a simulated dark nighttime setting. They found that the luminance values of the billboard signs were generally consistent across their three tests, and they concluded that "it is probably reasonable to expect that the luminance of a conventional billboard would not be likely to exceed about 280 cd/m^2 during the nighttime" (p. 4).

When discussing luminance measurements for DBBs, the authors make several recommendations:

- Luminance measurements should be made directly in front of a sign.

- Because LEDs have higher light output at lower temperatures, measurements should be made within predefined, and consistent ambient temperature ranges.

- A luminance meter aperture of 1 deg or less should be used.

- Because LED billboards are composed of arrays of LEDs, their surfaces are not uniform. If viewed from very close distances, they will appear as an array of bright points against a dark background. Thus, a viewing distance of approximately 50 ft is suggested, since a 1-deg meter aperture would subtend approximately 10 in at this distance, sufficient to ensure uniformity of the display.

- Since light from the ambient environment adds to the recorded luminance, measurements should not be taken at distances greater than that suggested above.

- Measurements should be made while the sign display is white to present the maximum luminance values.

In its draft regulations, the State recognized that DBBs at night, if excessively bright, could not only cause distraction, but also could compromise dark adaptation, particularly for older drivers. (The potential for discomfort or disability glare was not discussed in the State's proposal, but was briefly addressed in the RPI report). Based on RPI's work and as a result of the State's review of the billboard industry's own published literature, the State initially recommended a "maximum brightness" for DBBs at night of 280 cd/m^2. This upper limit remained in force when the State issued its final regulations.

On behalf of the government of Queensland, Australia, TERS (2002) also described a specific measurement technique using luminance, and identified specific constraints for nighttime luminance levels. Appendix D to their report cites, as a basis for their guidelines, the research results from Johnson and Cole (1976) that "brightness from illuminated Advertising Devices directed at road traffic should be minimized under all conditions" (p. 20).

Similar to the work by RPI for NYSDOT, these authors indicate that the surroundings in which the billboard is located is a major factor that affects its brightness, given a particular luminance level. They have defined three "Lighting Environment Zones"

The maximum recommended luminance levels for billboards of all sizes, measured in cd/m^2, are as shown below:

Lighting Environment Zone 1	Lighting Environment Zone 2	Lighting Environment Zone 3
500 cd/m^2	350 cd/m^2	300 cd/m^2

TERS describes its luminance measurement methodology as summarized below:

- Allow the billboard to "burn in" for at least 100 hours.

- Use a luminance meter with a field of view of 2 degrees.

- Ensure that no ambient background area or spurious light source beyond the billboard is included in the field of view of the luminance meter.

- Take the measurement with the operator standing at the edge of the traveled way, in a direct line, and at a longitudinal distance from the billboard determined by a formula shown as:

  $$x = 28a \text{ meters}$$

  where x is the longitudinal distance from the billboard and a is the short dimension of the billboard. Thus, for a billboard that measures 14 ft. (4.3 m) in its shortest dimension, the measurement would be made from 120.4 meters (395 ft.) away.

- If the longer axis of the billboard is greater than 1.5 times the shorter axis, take a series of measurements and average the results to determine a mean luminance level for the entire sign face.

Although the luminance measurement distance recommended by TERS is greater than that proposed by RTI, there is a simple explanation for this apparent discrepancy. First, the measurement technique presented by TERS is for use with conventional billboards, and recognizes that there may be wide variations in luminance at different positions across the sign face. Thus, their measurement technique places the luminance meter sufficiently far from the billboard to take in the overall sign face without also including nearby ambient lighting sources. If the TERS measurement methodology were to be applied to a DBB, and if the measurements were to be made with a uniform white sign face, as proposed by RPI, then it is likely that the proposed measurement distances would be closer, recognizing that TERS suggests a 2 deg field of view and RPI suggests 1 deg.

Recommendations.

The measurement of luminance is reasonably straightforward, and, although there are some technical disagreements on how this measurement should be made, these differences are minor. Both New York State (Bullough and Skinner, 2008) and the Queensland (Australia) government (TERS, 2002) use equivalent methods, which are similar to the approach recommended by an FHWA expert in this field (Andersen, 2008b).

These methods can be adopted for use by any jurisdiction, with two caveats. First, although Queensland has explicitly recognized the need for different maximum billboard luminance levels depending upon different roadway environments, such ambient lighting conditions in the U.S. may differ from those in Australia, and State and local jurisdictions may wish to define their environmental surroundings to be in closer accord with local conditions "on the ground." Second, given that luminance standards must establish maximum acceptable levels, it is important that the any measurement of DBBs in the field be done with the signs set to their maximum output, i.e. displaying a completely white screen. Because digital billboards can display an essentially infinite variety of colors and patterns, it is not appropriate to take field measurements of signs displaying actual messages, since, at any given time, such messages may not represent the maximum luminance values of which the sign is capable. (Figure 6 shows a DBB which, because of its color, may be representative of a low luminance level).

The OAAA, in its "Code of Principles on Digital Billboards" (OAAA, 2008) makes the following statement with regard to DBB luminance:

> We are committed to ensuring that the ambient light conditions associates with standard-size digital billboards are monitored by a light sensing device at all times and that display brightness will be appropriately adjusted as ambient light levels change.

Although not included within its code of principles, the OAAA (2008) states:

> The outdoor advertising industry has established guidelines after commissioning research by Dr. Ian Lewin, a former chairman of the Illuminating Engineering Society of North America (IESNA). Digital billboards, according to the standards, should have lighting levels no more than 0.3 foot candles (fc) above the level of surrounding ambient light conditions."

Unfortunately, this research study is not available on the OAAA website, and OAAA officials refused our request for access to Dr. Levin's research. The language reported by the organization on its website, however, suggests two problems with their approach. First, they used illuminance as their measurement technique, whereas other organizations used luminance. Second, the OAAA expert apparently recommended that DBBs be controlled such that their maximum display output is capped at a fixed amount (0.3 fc) greater than the surrounding environment. This specification may be inappropriate because illumination levels do not increase in linear fashion. Thus, a DBB with an output that is 0.3 fc higher than the ambient illumination in an urban environment (where the majority of DBBs are likely to be located) will appear to the driver to be much brighter than official TCDs and other traffic, whereas a DBB with an output that is 0.3 fc higher than that of a suburban or rural environment may not appear to be so extremely bright, and may be less likely to overwhelm important safety targets and signals of lower luminance.

There is one ambient lighting/weather condition that suggests a need for an exception to the recommendations that DBB luminance controls are unnecessary in daylight. This exception occurs during daytime fog. In daytime fog, the ambient lighting conditions may be described as high brightness and low contrast. The water vapor in the atmosphere scatters light sources and may cause glare. In dense fog, drivers may have difficulty seeing vehicles ahead of them, even when these vehicles have their lights on. Multi-vehicle crashes are not infrequent in dense fog, and this is often attributed to drivers being unable to see vehicles ahead of them in sufficient time and distance to stop. The very high luminance levels of which modern DBBs are capable, and to which they are typically set during daylight so as to be visible in full sunlight, may have a potentially deleterious effect in fog, especially if the DBB is placed so that it is close to the center of the driver's focal vision upon approach, such as might be the case on a horizontal curve

As recommended by the OAAA, DBBs should be equipped with sensors that measure ambient brightness, and dimmers that can control the sign output to predetermined levels. Although necessary, this is not sufficient. These predetermined levels should be established by the means suggested above. Further, if the onboard sensors cannot detect daylight fog and adjust the sign's output accordingly, jurisdictions should develop their own output limitations for these conditions.

The good news is that regulatory bodies and billboard companies seem to reach similar conclusions about the maximum luminance values that billboards should not exceed under defined conditions. If these two stakeholder groups can agree upon measurement

methods, environmental descriptors, and means for ensuring that limits are not exceeded, one of the key concerns about the distraction potential of DBBs could be close to resolution.

DISPLAY LUMINANCE IN THE EVENT OF FAILURE.

There are a number of failure modes that can affect the luminance of a DBB, and there have been reported cases of failures in which the display luminance defaulted to a level far higher than intended or permitted.

Although, as discussed above, the OAAA provides guidance on its website and in periodic reports about suggested upper limits on display luminance (which it calls brightness, and suggests that DBBs include a device to automatically control the sign brightness relative to the ambient environment, the organization is silent on the issue of luminance control in the event of system or subsystem failure.

Recommendations.

Roadway authorities should incorporate into their guidelines verifiable requirements that, in the event of any failure or combination of failures that affect DBB luminance, the display will default to an output level no higher than that which has been independently determined to be the acceptable maximum under normal operation. If this cannot be achieved, then the display should be required to default to an "off" position until the problem can be resolved.

LONGITUDINAL SPACING BETWEEN DIGITAL BILLBOARDS.

As noted by the OAAA, different States have widely varying longitudinal spacing requirements for billboards in general and DBBs in particular. These requirements are typically described by the distance in feet that the nearest billboards must be spaced from one another. Often there is a different spacing requirement for billboards on opposite sides of the road. From the perspective of potential driver distraction, however, longitudinal billboard spacing should not be based on absolute distance, but upon whether two or more such billboards are within the driver's field of view at the same time, and, consequently, whether the unsynchronized changing messages on such billboards can distract by conveying the appearance of flashing. Accordingly, longitudinal spacing minima may vary depending upon prevailing travel speeds, sight distance, and topography, and thus may vary considerably from one location to another, even within the same jurisdiction.

Recommendations.

Governments or roadway operating authorities should establish minimum longitudinal spacing requirements for DBBs such that an approaching driver is not faced with two or more DBB displays within his field of view at the same time. This minimizes the risk of distraction and ensures that a flashing effect (that may be caused by two [or

more] different signs cycling through messages on different programs) will not occur. Any such longitudinal spacing requirements should address signs on both sides of the roadway. If a consistent spacing requirement is appropriate or necessary within any particular jurisdiction, then the most conservative spacing consistent with the above requirements should be established.

DBB PLACEMENT WITH RELATION TO TRAFFIC CONTROL DEVICES AND DRIVER DECISION AND ACTION POINTS.

Beyond the design and operational characteristics of DBBs themselves (brightness, display duration, etc.) perhaps the most important DBB characteristic with impact on traffic safety is the placement of such signs in relation to driver decision and action points, and to the traffic control devices (signs, signals and markings) that aid drivers in these decisions and guide them in these actions. Specifically, it is understood that the cognitive demands on drivers is greatest (other factors held constant) when they must position themselves to take an exit, enter a freeway, reduce or drop lanes, merge with other traffic, change route, etc..

The independent research reviewed for this report recognizes the importance of such constraints almost without exception, and the many jurisdictions, in the U.S. and abroad, that have published guidance and/or regulations nearly all address these concerns. And although these guidelines and restrictions are not fully consistent across regulatory agencies, they are remarkably similar. Although some published guidance and regulation is too vague to be useful in terms of enforcement potential or proven safety benefits. Others may well serve as a model that State and local governments, and other roadway authorities might adopt.

We believe that the adoption of objective constraints for DBB placement in relation to official TCDs, to intersections and interchanges, and to decision and action points is firmly justified because, to a great extent, the design and placement of TCDs themselves is the result of empirical research that has led to nationwide standards. Similarly, the design of intersections and interchanges, and of roadway design for safe and efficient traffic movements, is based on long-standing, well-researched, thoroughly documented principles. Accordingly, we believe that prohibitions against the placement of distracting irrelevant stimuli in roadway settings where drivers must make decisions and take actions should be imposed.

Recommendations.

The guidance provided by the government of Queensland, Australia is particularly well researched and documented, and might serve as a basis for US highway agencies. Similarly, the recommendations promulgated in New South Wales, Australia, are relevant, as is the guidance developed in South Africa, with specific regard to the placement of DBBs relative to official traffic signs.

ANNUAL OPERATING PERMITS.

There are several reasons why a Government agency or toll road or other roadway operating agency might want to rescind the operating permit for a DBB after initial approval. For example, traffic delays, crashes, or other operational difficulties may increase and the authority may attribute such difficulties to the presence or operation of the sign. New technologies may become available and used on the sign that the authorities find inappropriate. The sign may experience frequent failures or misoperation. The road abutting the sign may need to handle increasing traffic, or may need to be upgraded with additional lanes, interchanges, or signage, placing the DBB, after the fact, in a location that the authorities believe to be unsafe.

The City of Oakdale, Minnesota, as discussed in Section 5, grants annual permits to operate DBBs; the permits must be renewed each year. This allows the City to maintain oversight of sign operation, and facilitates updates to controlling legislation should new technologies emerge or should new operational data or research findings suggest needed changes to sign location or operation. Without such a process, a permitted sign may continue to operate unchecked, regardless of whether new information would suggest modifications to placement or operation.

Recommendation.

Government agencies and roadway operating authorities might consider the practice adopted in Oakdale, Minnesota, whereby owners of DBBs are granted a permit to operate a sign for a year, and must renew the permit annually.

SECTION 7.

DIGITAL BILLBOARDS ON-PREMISE AND ON THE RIGHT-OF-WAY

Digital Billboards as On-Premise Signs.

On-premise signs, those that advertise products or services that are available on the property on which the sign is located, have been a mainstay in the US for generations. The objectives of the current project were to "develop guidance for state DOTs and other highway operating agencies with respect to the safety implications of the digital display technology for outdoor advertising signs." Traditionally, outdoor advertising signs refer to billboards, also known as off-premise signs. As such, on-premise signs are outside the scope of this report. However, to the average motorist, the difference between billboards and on-premise signs is transparent. In addition, as the cost of LED display technology comes down, and as the power of this technology grows, it becomes more likely that roadside businesses, particularly those with multiple users such as shopping centers, auto malls, sports complexes, and entertainment venues, will increasingly install large digital advertising signs on their property.

Generally, despite the fact that such displays may use the same technologies as billboards, the owners/operators of these signs are represented by different organizations, and they have been regulated quite differently than have roadside billboards. On-premise sign regulation is typically accomplished through local zoning codes, and may, in general, be far more variable and likely less stringent with regard to the means of the display, display characteristics, or the size of the sign than comparable controls on billboards. Many such codes have changed little in recent years, despite the growth of digital technology for on-premise displays.

From the traffic safety perspective, it is possible that the risk of driver inattention and distraction is higher for some on-premise signs than for some DBBs, because on-premise signs may be larger and closer to the road, mounted at elevations closer to the approaching driver's eye level, and placed at angles that may require excessive head movements, In addition, many such signs may display animation, full motion video, sound, and other stimuli.

To our knowledge, the largest digital advertising sign in the world is an on-premise sign, mounted on the roof of a grocery warehouse and store in New York City. This sign, shown in Figure 7, is 90 ft tall by 65 ft wide[15], and is mounted on a 165 ft tall steel post on the roof of the warehouse, adjacent to a major interstate highway. The sign, claimed to be visible for over two miles, was recently used during a five-month period to present a rotating series of 19 animated spots for a local magazine. The animation took advantage of the "billboard's ability to display high-impact full motion video and graphics." The

[15] The face of this sign measures 5,850 sq ft, nearly nine times the size of a typical roadside DBB.

president of the company that created the commercials said: "It's really a blast to be driving around the city and suddenly see your work looming over all of this traffic entering and leaving the city" (Black Hammer, Undated).

Figure 7. The world's largest LED sign; an on-premise sign in New York City. The sign measures 90 ft tall by 65 ft wide and is mounted on a 165 ft tall steel post on the roof of building.

For transportation agencies and traffic safety organizations concerned about the risks of driver distraction, digital on-premise signs should not be overlooked as a potentially important near-term concern.

Strictly from the perspective of driver safety, agencies might want to consider restrictions for on-premise sign operations at least as rigorous as those for billboards, as well as restrictions on size, height, proximity to the right-of-way, and angular placement with regard to the oncoming driver's line of sight. Of all of the guidelines proposed in this report for DBBs, there may well be an equal or greater need to consider similar controls for on-premise signs. In addition, consideration must also be given to such signs' capacity for animation, flashing lights or other special effects, and full motion video.

DIGITAL BILLBOARDS WITHIN THE RIGHT-OF-WAY

On October 10, 2008, Nevada Director of Transportation, Susan Martinovich, transmitted an SEP-15 project application to FHWA's Nevada Division Administrator, Susan Klekar, titled: "Auctioning Rights to Construct Enhancements on and within Roadway Interchanges" (Martinovich, 2008).

The heart of the proposed program is the "enhancement" of selected interchanges by private partners that have submitted the highest or best value bids to the State. The application suggests that these enhancements may include landscaping, "architectural facades such as archways, public art or other aesthetic features" (p. 2). In exchange for developing and constructing these enhancements (and, it is suggested, removing them at the end of the lease term) the winning bidder "would be allowed to advertise within the interchange right of way limits" (p. 2). Although the application places no restrictions on the type of advertising that might be considered, the State suggests that this advertising might likely take the form of "incorporating the private partner's trade name, trademark, logo or other similar device into the design of the proposed enhancements" (p. 2).

The application States: "No design or enhancement would be accepted that would create a safety issue for motorists or pedestrians" (p. 2), and "safety will be foremost. No design will be allowed that will compromise safety" (p. 5). Given that the State proposes no *a priori* assessment of potential safety impacts, that the installations will be in place for 10 or more years, and that the only suggested safety analysis would be an undefined comparison of accidents; it is difficult to understand how this commitment to safety could be fulfilled.

Further, although the State's application does not mention that any of the potential enhancements will involve electronic signage, neither are such displays foreclosed. In fact, the final paragraph of the application states: "The tourism based economy of Nevada relies on spectacular displays, be they man-made or natural. Such exceptions (sic) of grandeur make this program an ideal match" (p. 9). When the recognition of man-made spectacular displays is associated, as this proposal is, with "context sensitive design," the potential for the types of enhancements that are associated with Las Vegas and Reno cannot be discounted.

On August 27, 2008, the Director of the California Department of Transportation (Caltrans) wrote to the Secretary of the US Department of Transportation seeking support for the expansion of its efforts "to integrate private sector participation in the provision of infrastructure, service, and ongoing maintenance of the State's transportation system" (Kempton, 2008). One of the "potential opportunities" for such partnership was described as follows:

> The Department's system of changeable message signs could be enhanced through private sector participation. In exchange for use of the space on the signs for commercial purposes, businesses could enhance the level of graphics, provide a steady income source, and use state-of-the-art technology to increase the quality of transportation and safety-related messages that are relayed to the signs.

At the time of the Caltrans request, the popular press (see, for example, McGreevy, 2008, Miranda, 2008) reported that the initiative was proposed by Clear Channel Outdoor, one of the country's largest providers of DBBs. The Caltrans proposal has raised numerous concerns within the highway safety community. A significant concern is that this

initiative, if it went forward, would be in direct violation of several key sections of the Manual of Uniform Traffic Control Devices (MUTCD, 2003). Examples include:

> Traffic control devices or their supports shall not bear any advertising message or any other message that is not related to traffic control" (p. 1A-1).[16]
>
> Changeable message signs shall display pertinent traffic operational and guidance information, not advertising" (p. 2E-20).
>
> When a changeable message sign is used to display a safety or transportation related message, the display format shall not be of a type that could be considered similar to advertising displays. The display format shall not include animation, rapid flashing, or other dynamic elements that are characteristic of sports scoreboards or advertising displays (p. 2A-3).

Other sections of the MUTCD, including those that address signage that might be considered closer to messages that are commercial in nature, nonetheless prohibit advertising. For example:

> The content of the legend on each panel (of a Tourist-Oriented Directional Sign) shall be limited to the business identification and directional information for not more than one eligible business, service or activity facility. The legends shall not include promotional advertising" (p. 2G-1).

Indeed, in official interpretations of the MUTCD and its purposes over the years, the FHWA has consistently taken a strong position in opposition to advertising within the right-of-way, and has supported its views with the legal opinion of its chief counsel.

For example, in 2001, in a policy memorandum addressing the purpose of "Adopt-a-Highway" signs and their treatment in the MUTCD, then FHWA Deputy Executive Director Vincent F. Schimmoller stated, in part:

> Recently, it has come to our attention that there are a significant number of Adopt-a-Highway signs throughout the country displaying commercial trade logos, slogans, telephone numbers, Internet addresses, and similar forms of commercial promotion… These signs are clearly intended for advertising to the passing motorists rather than acknowledging the litter pickup service of an organization for which the program was intended…These actions concern us and we would like to clarify Federal Highway Administration's (FHWA) position on this subject.
>
> Adopt-A-Highway signs displaying commercial trade logos, slogans, telephone numbers, Internet addresses, and similar forms of commercial promotion are not in conformance with the 2000 MUTCD.

[16] Note that this "Standard" is the very first requirement specified in the MUTCD and is included in Section 1A.01, titled: "Purpose of Traffic Control Devices."

> Further, the placement of commercial advertisement within the roadway rights-of-way is a violation of Federal law and regulation.... Allowing the use of commercial advertising signs along the roadway is a disservice to the traveling motorist who is relying on roadside signs for regulatory, warning, and guiding information. The Specific Sign Logo program and the Tourist Oriented Destination Sign programs, which are in compliance with the MUTCD, have been developed to provide guidance information to the traveling motorist.

This memorandum was supported by an attached legal opinion from the FHWA Chief Counsel (Malone, 1996). This document stated, in part:

> Signs erected solely as advertising signs do not fit any of the accepted categories of the MUTCD. They certainly do not regulate or warn motorists. Nor do they "give such information as will help them [motorists] along their way in the most simple, direct manner possible"... They are not concerned with promoting "the safe and efficient utilization of the highways"...Advertising signs on the right-of-way therefore are not approved signs under the MUTCD.
>
> It would be ludicrous to suggest that Congress, while mandating the States to control advertising along thousands of miles of Interstate and Federal-aid primary highways, would also allow the States to erect billboards on the rights-of-way of those same thousands of miles of highway.

In closing, the Chief Counsel expressed his belief that "FHWA clearly has the authority to withhold funds from a State that allows the erection of billboards on the rights-of-way, an act which constitutes a failure to comply with Title 23 requirements."

More recently, Federal Highway Administrator Peters (2003) issued in interim policy on Acknowledgment Signs on rights-of-way. She said, in part:

> The FHWA recognizes a distinction between signing intended as advertising and signing intended as an acknowledgment for services provided.
>
> With regards to advertising signs within the highway right-of-way, the FHWA reaffirms its long held position that advertising is not permitted on highway rights-of-way.
>
> Generally speaking, an advertisement has little if any relationship to a highway service provided. The advertiser wants to get its recognizable company emblem or logo before the motoring public, and, if possible, information on how or where to purchase the company products or service. If the acknowledgment sign goes beyond recognizing the company's contribution to a particular part of the highway and includes phone numbers or Internet addresses, the sign would more properly be termed an advertising sign.

Even in her recognition of the acceptable role of acknowledgment signs in specific applications, Peters stated that "a compelling responsibility for public safety" leads the FHWA to find certain locations inappropriate for such signs, including "on the front, back or around the perimeter of any traffic control devices, including but not limited to:

- Traffic signal heads and supports,
- Any regulatory, guide or warning sign,
- Changeable message sign,
- Traffic control device posts or structures
- Bridge piers
- At any site where the acknowledgement sign would obscure the ability of a driver to detect and understand existing traffic control devices."

Further, she stated that such signs would be "inappropriate and not allowed on public highways...at key decision points where a driver's attention is more appropriately focused on traffic control devices or traffic conditions. These locations include, but are not limited to:

- Exit and entrance ramps and other lane-weaving areas
- Highway-rail grade crossings
- Work zones
- Areas of limited sight distance

In short, FHWA's ongoing policy, and its interpretation of the MUTCD and the legislation at 23 U.S.C. § 402(a) and § 109(d) under which the MUTCD was promulgated, have clearly expressed opposition to advertising of any kind within the right-of-way. Regardless of any benefits from the public-private partnerships that California and Nevada have suggested, and regardless of any State budgetary difficulties that might be eased by revenue from such partnerships, FHWA's position against advertising on the right-of-way has been consistently and, we believe, appropriately, based on its interpretation of the Federal Highway Administrator's authority to decide which signs "promote the safe and efficient utilization of the highways" (Malone, 1996).

Other highway and toll road operating authorities have been approached by advertising companies (see, for example, Dudek, 2008, p. 35), or have independently considered the use of outdoor advertising on new or existing signage within their rights-of-way (see, for example, The Port Authority of New York and New Jersey (PANY, 2006). There can be

little doubt that an official acceptance by FHWA of the ideas promulgated by California or Nevada in their recent SEP-15 initiatives would have important ramifications nationwide. Indeed, there is concern that some roadway operating authorities may not wait for FHWA action and may consider taking steps to approve advertising on their rights-of-way regardless of FHWA's position. The FHWA legal opinion discussed above (Malone, 1996) came in response to "a decision by the New Jersey Turnpike Authority to erect 12 double-sided billboards in the right-of-way of the New Jersey Turnpike…" And the PANY Request for Proposal advised proposers that "for the purpose of this analysis, the Consultant shall assume that the Authority is exempt from local, State, and Federal regulations, including FHWA policy" (Attachment A, Page 1).

Whether the placement and operation of DBBs within the right-of-way is a safety concern is an issue that is central to the present report. In addition, the precedent that would be set by the installation of such signs has important ramifications for the nation's highway system, and for the continued role of the MUTCD as the national standard for the design and use of official traffic control devices on streets and highways. Although a discussion of the history, development, and impact of the MUTCD is beyond the scope of this report, it bears comment that the document is unambiguous when it comes to the potential for commercial messages to be displayed on official signs.

It is the opinion of this author that permitting California to study its proposed exceptions to the requirements of the MUTCD and existing Federal law would bring about several adverse consequences:

- It would undermine decades of human factors research and application that ensures that information important to the driving task is conveyed to the motorist in the most clear, concise, succinct and unambiguous manner possible.

- It would set a dangerous precedent that would lead to similar actions by State and local governments, toll roads, and other private road operators nationwide.

- It would open to challenge the entire basis of the MUTCD, and erode confidence in and respect for the country's only standard for the proper use of traffic control devices on streets and highways.

And, most significantly, it would likely diminish safety and traffic flow on our streets and highways through a direct and immediate increase in driver inattention and distraction.

SECTION 8.

NEW TECHNOLOGY, NEW APPLICATIONS, NEW CHALLENGES.

This project has been focused on the impact of commercial electronic (digital) roadside signs on traffic flow and safety. Such signs, known as billboards in some jurisdictions and off-premise signs in others, are typically located outside the right-of-way, on private property, and they advertise products that are not sold, or services that are not performed on the property on which the sign is located. Billboards, regardless of the technology used to present and change the display, differ from on-premise signs in that the latter must be, generally, located on the premises at which the advertised service is performed, or product sold.

During the course of our research for this project, we learned of the growing use of new applications that increase the power and/or functionality of these digital, predominantly LED signs. These new applications have begun to appear on billboards in the US and abroad, on mobile (vehicle-mounted) displays, and on on-premise signs. Although some of these applications fall outside the charter of this project, this report would be incomplete without mention of them.

In most cases these new technologies and new applications are not addressed in Federal or local regulations and guidance; in some, regulations have already been imposed to address them. In a third category, some new developments appear to be in direct conflict with existing regulations or guidance. This chapter, although not contemplated when this project was initiated, will provide a brief overview of these new technologies and applications.

Billboard Audio and Other Stimuli.

Digital outdoor advertisements are already in use in some US locations that broadcast audio along with their visual messages. It is not unreasonable to assume that audio, and perhaps other attention-getting stimuli, may appear in the future. Internationally, we are aware that the SANRAL (2000) regulations recognize this potential, and prohibit it. Part B, Subsection 4 states: "No advertisement will be allowed that emits a noise, sound, smoke, smell or odours" (p. 13). In the U.S., both St. Croix County, Wisconsin, and the city of Tucson, Arizona, have similar requirements.

Digital Billboards on Moving Vehicles.

Vehicles in the traffic stream, primarily commercial trucks, have long borne advertisements for the truck owner or for the products being carried. One might think of these as mobile "on-premise" signs. In some cases, "supergraphics" (although, not, to our

knowledge, digital) have been demonstrated that can convert trucks or large, over-the-road trailers into dramatic mobile visual images. One example is shown in Figure 8.

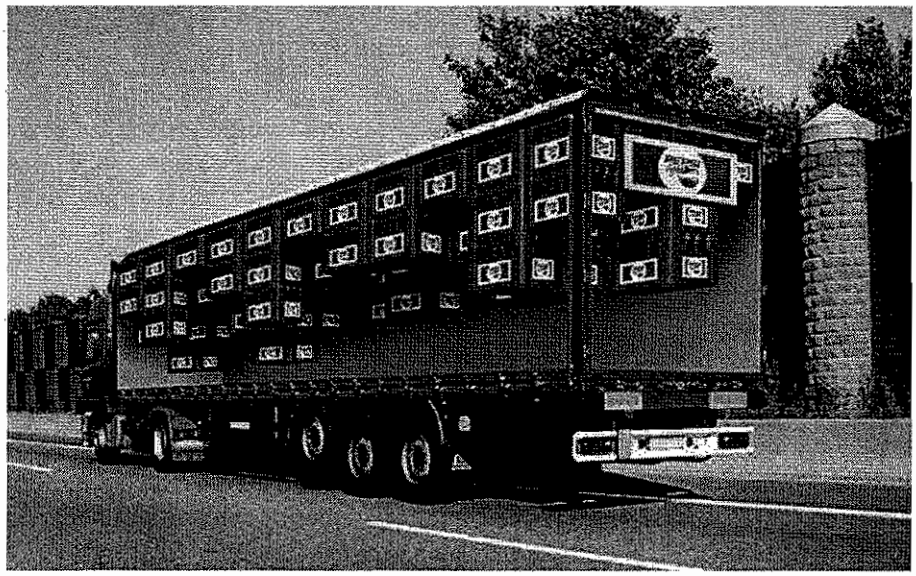


Figure 8. An over-the-road trailer featuring "supergraphic" imagery.

Urban and suburban taxicabs, buses, and rail transit vehicles may also display advertisements, and increasingly, these advertisements feature LED signage. These are the equivalent of mobile "off-premise" ads in that they advertise a product or service that has nothing to do with the vehicle displaying the ad.

For example, as part of its "Prepare Bay Area," earthquake preparedness campaign, the (San Francisco) Bay Area Chapter of the American Red Cross faced a truck with a two-sided artist's rendering of what downtown San Francisco might look like after the next earthquake. The truck drove around the city to attract attention, then parked at a location where the billboard lined up perfectly with the existing streetscape, as shown in Figures 9a and 9b.

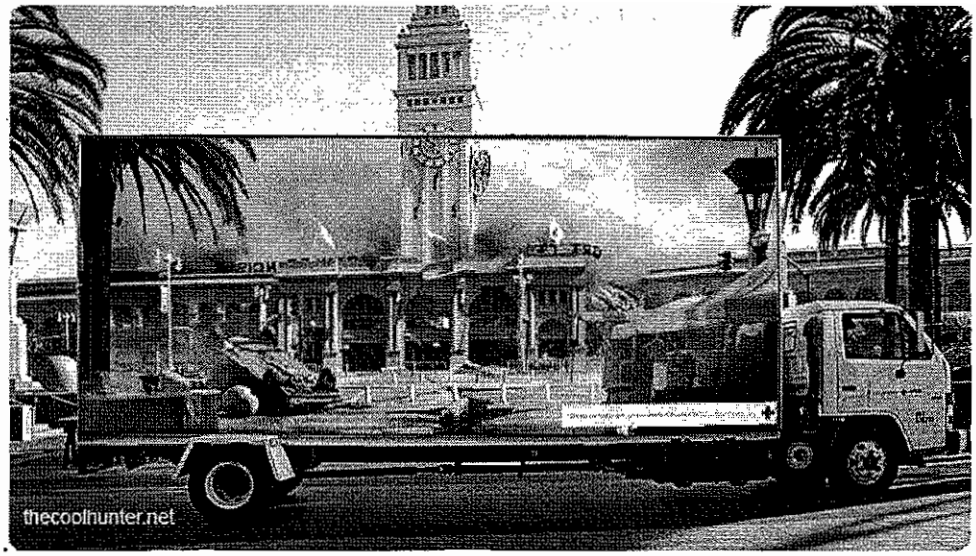


Figure 9a. A mobile billboard from the (San Francisco) Bay Area Chapter of the American Red Cross parked in front of a building, depicting what might happen to that building after an earthquake.

Figure 9b. The same mobile billboard shown in Figure 8a looking in the opposite direction.

In the past few years, a number of products have become available that take advantage of the latest technologies to incorporate LED billboards onto the sides and rear of commercial trucks. In many cases, the sole purpose of such vehicles is to serve as a rolling advertisement; in others, the truck may display advertising while in transit, then park at a specific location to use its large-screen display in support of a concert, sporting event, parade, or other special function. In the latest advances, these signs can be raised electrically or hydraulically above the roof level of the truck; in some cases they can also rotate 360°. One company, named GoVision, advertises that its vehicles can display full

motion video while in moving traffic. Indeed, news reports indicate that this occurred recently in Boston. On its website (www.govision.com) the company describes two products, a 40 ft trailer with a 9 ft high by 16 ft wide LED screen, and a 48 ft trailer equipped with a 627 sq ft, high definition video (720p resolution) wide LED screen.[17] The smaller vehicle, with its LED screen blank, is shown in Figure 10.

Describing this "moving television" product, the company suggests these uses:

- Get stuck in morning traffic playing a breakfast products commercial
- Drive around a sporting event's traffic promoting the new high powered SUV
- Add GoBig to your Xmas parade playing the latest holiday movie clips

Figure 10. A 40 ft trailer with an integral LED video screen measuring 9x16 ft. The screen shows full motion video while the truck is moving in traffic, and can be raised to a height of 25 ft for viewing while parked.

In other, less dramatic examples, several urban and suburban commuter bus and rail systems have begun to integrate digital billboards onto the sides of their vehicles. Figure 11 shows an urban transit bus displaying a digital advertisement.

[17] A standard size highway billboard, conventional or digital, measures 672 sq ft.

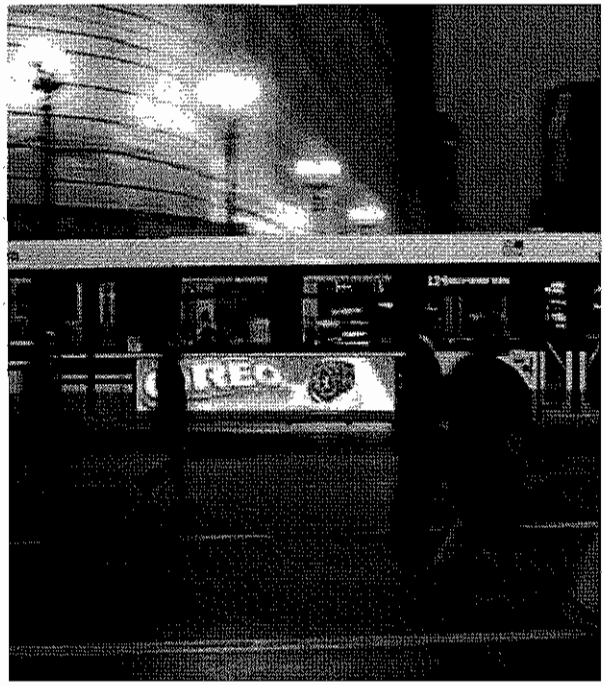


Figure 11. An urban transit bus displaying an LED billboard in traffic.

Although we are unaware of any research that has been conducted to evaluate these mobile display units, it would seem that the potential for driver distraction from the use of this technology within the traffic stream is quite high, not only because the changeable (and video) signs are in physical motion, but also because the presence of the advertising signage at extremely close lateral distances may require an extreme eye and/or head movement for the sign to be seen.[18]

As discussed earlier in this report, several jurisdictions have recognized or anticipated the risk of vehicle-based advertising, and have imposed restrictions on its use. In some cases, these controls are also directed at such vehicles when they are in operation while parked adjacent to roads visible to passing drivers within the jurisdiction's control. See, for example, the ordinances of St. Johns County, Florida, and Tucson, Arizona, discussed in Section 5.

[18] It is noted that digital display technology using LEDs is also being marketed to the general public as a mechanism both for "personalizing" a vehicle, or for "marketing," "while providing automobile owners with an opportunity to profit from driving their vehicle." (See, for example, LED Wheels, 2004). Although there is clear potential for driver distraction from such vehicle-mounted digital imagery, it is beyond the scope of this project to determine whether such applications would constitute commercial advertising and thus be subject to the controls in place in certain jurisdictions and which may be considered for adoption in others.

"Personalized" And Interactive Billboards.

Interactive billboards, those that permit, support, or encourage personalized communications with the driver *in real-time*, have begun to appear on US roads, although this technology seems to be more progressing more quickly in Europe. Made possible by newer and ever more sophisticated technologies include cellular phones, text messaging, RFID, infra-red cameras, and others, these DBBs may take several different forms. These are briefly discussed below.

a. Signs that convey a personal greeting to the driver.

The popular Mini Cooper automobile, owned by BMW Corporation, has introduced a series of billboards in major US cities that display a static image of the automobile, along with a one line digital display that is normally blank. However, if the owner of a Mini Cooper has "opted in" by expressing an interest in the program, the sign's digital display will present a "personal greeting" to the approaching driver. Figure 12 illustrates one of these billboards in use in New York City.

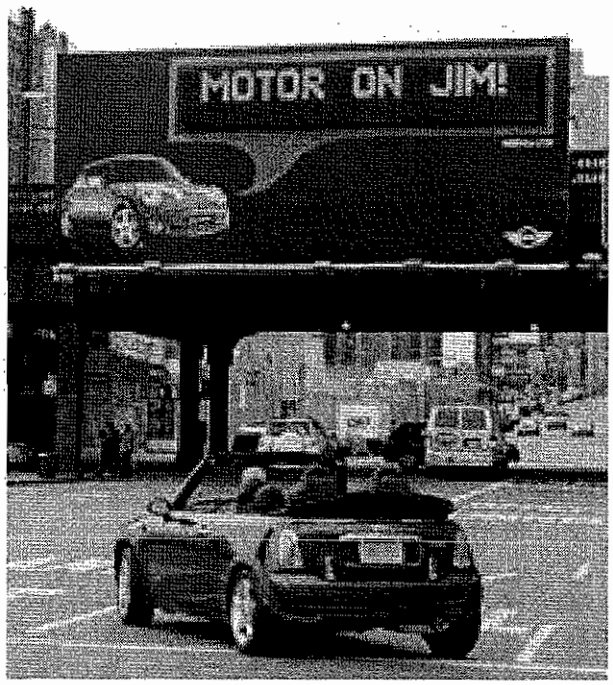


Figure 12. Personalized Mini Cooper billboard.

b. Signs that interact with the driver in real time.

In Paris, a trial has begun in which cell phone users who have agreed to participate will receive phone calls from billboards (Christensen, 2006; Crampton, 2006). These calls will offer additional product information, promotions, etc., that are keyed to the users' location-enabled cell phones. The enabling technology was originally developed by the French National Institute for Research in Computer Science and Control to provide assistance to disabled people. According to the outdoor advertising

company that is running the project: "With this project, we are really starting to create the personalized digital city… We eventually will see a rich dialogue running between mobile phone and what are now uncommunicative objects."

In Belgium, as a driver approaches the digital billboard shown in Figure 13 the sign displays a series of codes. The driver chooses one, and sends a text message to an indicated number. The billboard responds by sending a return message containing a question. The driver then texts his answer to the question. The answer, in turn, triggers the DBB to respond like a pinball machine. A correct answer causes the sign to light up, and the driver is entered into a drawing (in this case, for the pictured car); a wrong answer causes the sign to "tilt"

Figure 13. Interactive billboard in Belgium. See text for details of the sign's operation.

c. Signs that unobtrusively obtain information from drivers and vehicles.

Adjacent to an exit ramp along US 99 in Turlock, California, a "smart" 20 ft by 30 ft high-definition DBB (Figure 14) monitors the passive "local oscillator" signals emitted by the FM radios of passing vehicles. These signals reflect the frequencies to which the radios are tuned. The system compiles the statistical data, merges it with a media audit database that contains detailed consumer demographic and purchasing pattern information coded by radio station format, and enables the sign to post ads targeted to that demographic. "Smart Signs could inform passing motorists about special offers to shoppers as they approach stores or malls. A Smart Sign could entice consumers to respond via text message to a question posed by the sign. Information can even be pulled off the internet and displayed" (Christensen, 2007).

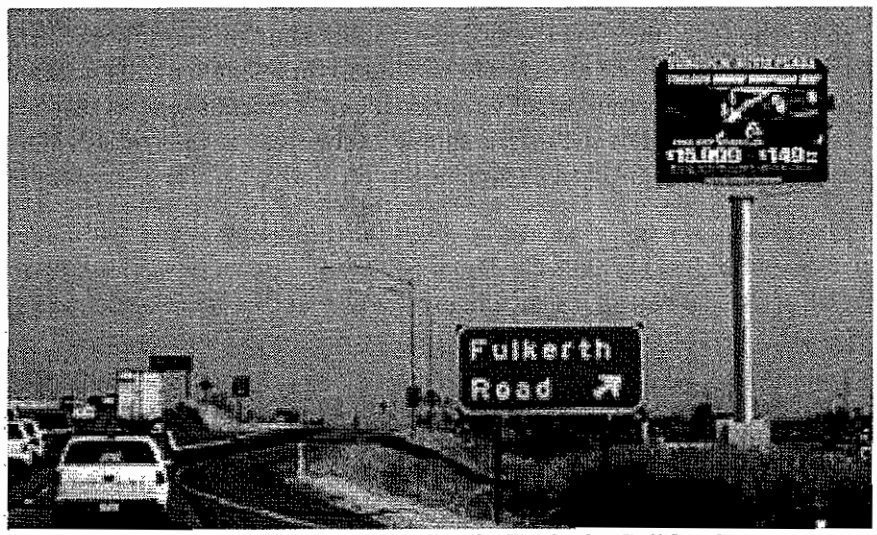


Figure 14. A "smart" DBB in Turlock, California

Many digital billboards have been equipped with video cameras that can record approaching traffic. A recent service aimed at the outdoor advertising industry permits an inconspicuous billboard-mounted camera, supplemented with an infra-red surround lighting device, to record the eye-movements of drivers approaching the sign (Skeen, 2007). Although this service is currently offered as a means to demonstrate to sign owners the amount of driver attention being given to their sign and its specific messages, it is a small technological step to combine these eye movement recordings with other demographic or personal information to target personalized messages or provide other "services."

DBB Hacking.

One concern about DBBs, unlike any other in this report, is the potential for computer "hackers" to break into the control or communications system for these displays and change the messages and images displayed. For many years, loosely organized groups like the Billboard Liberation Front have made commercial billboards their targets for mischief. The type of technology that wirelessly controls DBBs has proven vulnerable to such vandalism, although reports of such hacking have been disputed.

Related technologies, such as those used for official portable changeable message signs (PCMS) have been successfully hacked in different jurisdictions on several occasions. Just before this report was finalized, the popular news media reported on a series of such hacks at a construction zone in Austin, Texas (Miller, 2009). Figure 15 shows one PCMS that was affected by this activity. At the same time, several websites published detailed instructions on how to perform such hacks (see, for example, Wojdyla, 2009). Although this latest example of vandals hacking into digital signs was quickly fixed by the sign manufacturer, the fact remains that roadside digital control technology is susceptible to being taken over by criminals or pranksters intent on changing the messages and images

displayed on the signs for their own amusement, political or social purposes, or for other reasons. DBB owners and operators should be alert to these challenges, and should design, develop and implement corrective actions. Government agencies responsible for the regulation and oversight of such signs should ensure that any potential vulnerabilities are protected against.

Figure 15. A portable changeable message sign (PCMS) that was "hacked."

SECTION 9.

SUMMARY AND CONCLUSIONS

This project has focused on three overlapping pillars of support in its effort to develop suggested guidelines for the control of DBBs: (a) human factors practices and principles; (b) guidelines and regulations currently in place in the US and abroad; and (c) the research literature.

Human factors principles have been developed over many years through empirical research, and have seen applications in practice regarding road safety throughout the developed world. Such principles and practices are codified in standards such as the MUTCD and SARTSM, to name but two, which were reviewed for this report. The wisdom of such human factors practices and principles is tested daily on streets and highways, and they are constantly being modified or supplemented when a "better mousetrap" is developed through research (recent examples include the development and implementation of the Clearview font for road signs, and the growing use of wider pavement markings to accommodate our ageing driver population).

And, in the guidelines and regulations that we reviewed, it was rewarding to learn that many of them, too, come from a solid research base. Examples of these empirically grounded guidelines include those in South Africa, Queensland, Australia, and The Netherlands (currently under development). Of course, some guidelines and regulations, even though based on sound research, either don't get enforced, or don't make it out of the draft stage. Thus, one of our goals has been to seek out the best supported and most practical guidelines that have been promulgated, review them based on their grounding in research and/or sound human factors practice, and hold them out as candidates that might serve as models for others to consider.

Our comprehensive and critical review of the literature focused on studies undertaken since the FHWA report of 2001, with the addition of several earlier studies that were included because of their relevance and because they were not previously given in-depth consideration in this context. As required by the program Statement of Work, we also separately reviewed research undertaken by or on behalf of the outdoor advertising industry.

Unfortunately, this issue is enormously difficult to study. This is because every billboard, road, and driver is different. A study evaluating a four-second message display interval might obtain quite different results from one using eight-seconds. A study in daylight will almost certainly find different driver responses than the identical study conducted at night. And a study conducted with free-flowing traffic may have a different outcome than one that examines the same road and the same billboard when traffic demands are greater. In addition, the key selling point of DBBs is that they can change messages every

few seconds, and it is technically possible for them not to repeat the same message during a several hour cycle. Thus, studying such billboards *in situ* confronts the researcher with the added problem that it may be difficult to compare the experiences of any two (or more) drivers as they pass the DBBs under study for the simple reason that these drivers will, in all likelihood, experience signs with different content, different brightness levels, different graphics, and different font styles and sizes. This suggests that laboratory studies, despite what we believe to be important limitations, may permit better control over these inherent sign design and operational variables. Another alternative, not yet attempted with DBBs to our knowledge, involves a cooperative effort between researcher and sign operator in a field setting, so that the many relevant variables can be controlled and systematically presented to drivers, thus maintaining the validity of the field setting with some of the experimental control more commonly available only in the laboratory. Nonetheless, it is difficult if not impossible to design and conduct a research study whose results can be applied with confidence to DBBs as a whole.

In the recently published FHWA study, Molino and his colleagues (2009) comprehensively assessed the strengths and weaknesses of different research methods that might be applied to this challenge. When combined with the daunting number of DBB-related factors[19] (and levels within each factor), as well as the many measures that might be addressed to provide a complete answer to this research question, we believe that it is unlikely that any agency, private organization, or public-private partnership will have the resources available in the foreseeable future to undertake such a study. At best, future studies may be able to answer questions such as:

---

[19] A subset of the number of DBB-related factors that must be studied to fully answer questions about DBBs and traffic safety.

Message change interval
Duration of message change
Sign luminance at night
Sign dimensions
Distance of DBB to traveled lanes
Angle of sign orientation to the approaching driver
Proximity of DBB to official signs, or on-premise advertising signs
Number and width of lanes of travel
Roadway geometry – vertical and horizontal curvature
Speed limits and prevailing speeds
Traffic volume
Traffic mix (e.g. percentage of large trucks, buses)
Proximity of DBB to exit or entrance ramps, gores, lane drops, route divides
Familiarity of the motorist with the roadway
Weather conditions
Environment in which DBB is located (e.g. urban, suburban, rural)
Amount of information presented on a DBB
Information presentation (color, contrast, font, etc.).

- Is a DBB that changes its message every eight seconds more distracting than one whose message is fixed for 60 seconds or longer?
- Is a sign of night luminance X more distracting than one of luminance Y?
- Do DBBs within certain defined distances of entrance or exit ramps contribute to more erratic or delayed vehicle movements than DBBs at greater distances?

In short, the issue of the role of DBBs in traffic safety is extremely complex, and there is no single research study approach that can provide answers to all of the many questions that must be raised in looking at this issue. When we recognize that not every study is designed well or conducted rigorously, or where inappropriate assumptions are made or questions asked, there should be little wonder why research has not yet been able to fully "resolve" this issue.

Adding to the challenges of developing empirical answers that will satisfy the criteria for the development of guidelines or regulations is the fact that DBB technology and applications are evolving quickly. As costs come down and capabilities increase, new applications will be found for this technology. What will be the benefit of research that addresses the distracting effects of DBBs when on-premise LED signs will soon be proliferating – signs that may be larger, brighter, closer to the road, and displaying animation and full-motion video? Regulations promulgated for off-premise DBBs may seem quaint almost as soon as they are written. Potential research, even now, is years behind the implementation of the types of signs that are the subject of the research. How will we address the questions posed by roadside digital advertising that interact with the driver in real time by sending personalized messages to mobile phones, and requesting real-time responses by text messaging? And how will (or should) we address issues raised by digital signs that record potentially personal information about drivers passing such signs?

These are not questions that can be resolved in this report. There is hopeful news, however, about progress that has been made in forming and responding to key research questions. Almost without exception, the research studies discussed in this report have made dramatic advances in methodological sophistication, statistical power, and control of extraneous variables compared to those studies discussed in earlier research reviews. As a result, these more recent studies (primarily those completed within the past ten years) typically produce results and conclusions that are more reliable and valid than those of which their predecessors were capable. And, tellingly, the results of the most recent research are remarkably consistent.

A small number of important research studies, all published (or to be published) within the past several years, may have opened the door to a solution to the long-standing question of whether unsafe levels of driver distraction can occur from roadside billboards. The first, by Horrey and Wickens (2007) demonstrated that when making decisions that may result in road safety guidelines or regulations, we should be concerned, not with mean performance but rather with the poorest performances, those in the "tails" of the distribution. Of course, in many ways highway, traffic, and human factors engineers have been designing our vehicles and roadways in this manner for many

years. Human factors professionals speak of designing systems to accommodate the 95th percentile operator, (e.g. FHWA, 1998), roadway geometric design is often established based upon 85th percentile speeds (e.g. Schurr, et al., 2005), the size of letters on highway signs and the width of pavement markings are being increased to accommodate the older driver's deteriorating visual acuity, and even the duration of push-button actuations for pedestrian crossing signals is now based on research that focuses on the tails of the distribution (Noyce & Bentzen, 2005). Horrey's and Wickens' arguments were made in the context of a study that evaluated eyes-off-road time for interacting with in-vehicle technology, but the implications should be the same for external distracters such as DBBs, and have been so demonstrated by Chan et al. (2008).

The second study, a breakthrough known as the 100 car naturalistic driving study, has produced a number of separate reports (for example, Klauer, et al., 2005, Klauer, et al., 2006a, Klauer, et al., 2006b). Although "naturalistic" driving studies had been conducted on a small scale previously, Klauer and her colleagues at Virginia Tech Transportation Institute (VTTI) were the first to employ this methodology on a large scale. As discussed earlier in the present paper, these researchers placed 100 highly (but unobtrusively) instrumented cars in the hands of 100 people and allowed them full use of these vehicles for 18 months. There were no experimenters present in the vehicles, data was collected without any interference to the driver and was downloaded remotely, and the participants were free to drive these vehicles in any way they wished, as if they were their own. One finding from this work that is of particular interest in our discussion of DBBs is that a driver's eyes-off-road time due to external-to-the-vehicle distraction or inattention was estimated to cause more than 23% of all crashes and near crashes that occurred.

The third study of relevance here (Chan, et al., 2008), also discussed earlier in the present report, used a driving simulator to study the tails of the distribution when participants drove a five mile route while performing a series of in-vehicle and external-to-the-vehicle distracting tasks. The authors found, as they expected, that younger drivers, when dealing with the in-vehicle task, took their eyes off the road for a significantly longer time than did the older drivers (2.76 seconds vs. 1.63 seconds, respectively, when the measure was the mean length of the maximum episode of continuous inattention). Quite to the researchers' surprise however, were their findings that: (a) the maximum episode durations were much longer for the out-of-vehicle tasks than for the in-vehicle tasks, and (b) that the difference between the older and younger drivers in the out-of-vehicle tasks was small (pp. 16-17). Specifically, they found that the average maximum duration for the out-of-vehicle tasks (for all participants) was 3.54 seconds, vs. that for the in-vehicle tasks of 1.35 seconds, a highly significant difference. The difference in average maximum duration for out-of-vehicle tasks between the older and younger drivers, however, was 3.41 vs. 3.67 seconds, an insignificant difference. The authors' conclusion is that younger and older drivers are "equally bad" in being distracted by external stimuli, in that neither age/experience group has "learned to limit the durations of their glances off to the side of the vehicle" (p.22). Finally, even a study sponsored by the outdoor advertising industry (Lee, McElheny, & Gibbons, 2007), despite an experimental design that sought to minimize the differences between DBBs and other roadside stimuli, has produced results showing significantly longer average glance durations to roadside digital

signs than to "baseline" sites and to traditional (fixed) billboards, and, the researchers suggest, *all* measures of visual glances indicative of driver distraction would prove to be significantly worse in the presence of digital signs if a full study was to be conducted at night.

In short, we have made substantial progress in our understanding of the impacts on driver distraction from external-to-vehicle sources since the late 1990s. We now know that extended episodes (two seconds or longer) in which a driver's eyes are not attending to the driving task greatly increases (by 3.7 times) the likelihood of a crash (Klauer, et al., 2006a). Other researchers have suggested that the upper limit for an acceptable distraction episode may be 0.75 second (Beijer, et al., 2004, Smiley, et al., 2005) or 1.6 seconds (Wierwille and Tijerina, 1998). And, as shown both by Beijer (2002) in an on-road study, and by Chan and her colleagues (2008), in a simulator study, there is growing evidence that billboards can attract and hold a driver's attention for the extended periods of time that we now know to be unsafe. As stated succinctly by Beijer, his findings seem to show that "drivers are comfortable turning their attention away from the road for a set period of time, regardless of the demands of the driving task" (p. 76). And, as Chan, et al., describe it: "These data … indicate that it is likely that our out-of-vehicle tasks (which not only engage attention but also draw the eyes and visual attention away from in front of the vehicle) would have quite significant detrimental effects on processing the roadway in front of the vehicle" (p.22).

We also have data to show, despite a lack of analysis by the researchers, that an on-road study (Lee, et al., 2007) using an instrumented vehicle found many more such long glances made to DBBs and similar "comparison sites" consisting of (among other things) on-premise digital signs, than there were to sites containing traditional, static billboards, or sites with no obvious visual elements. Indeed, the mean values for these long glance durations proved to be significantly greater for the sites with digital signs than for the others. From the same study, we have evidence expressed by the researchers that if we were to conduct our research at night we would find that *all* measures of eye glance behavior would demonstrate significantly greater amounts of distraction to digital advertisements than to fixed billboards or to the natural roadside environment, and that driver vehicle control behaviors such as lane-keeping and speed maintenance would also suffer in the presence of these digital signs. Because the design of this study minimized the differences between the characteristics of DBB sites and the others, and did not report all of the pertinent data collected, it seems reasonable to believe that the differences found might be more pronounced in a more rigorous experiment.

When we add the results of these recent, applied research studies, to the earlier theoretical work by Theeuwes and his colleagues (1998, 1999), in which they demonstrated that our attention and our eye gaze is reflexively drawn to an object of different luminance in the visual field, that this occurs even when we are engaged in a primary task, and regardless of whether we have any interest in this irrelevant stimulus, and that we may have no recollection of having been attracted to it, we have a growing, and consistent picture of the adverse impact of irrelevant, outside-the-vehicle distracters such as DBBs on driver performance.

Beyond the issues of research, however, we also face what we might call a "criterion problem." States and local jurisdictions must ask themselves this question: What level of knowledge and what degree of certainty must we have before we can be confident in the issuance of guidelines or regulations about DBBs? For example, must we have demonstrable proof that DBBs *cause* crashes? This is the argument raised by the outdoor advertising industry whenever it challenges a local code or ordinance, or goes to court to overturn a permit denial. If crash causation is the standard that must be met, we may never get there. This is not necessarily because DBBs are not a causative factor in crashes; it is, as most researchers believe, more likely that our research methods are not sufficiently sensitive to identify this linkage. This, in turn, is a result of the substantial difficulties involved in conducting post-hoc statistical analyses of crash summaries for an issue that is so profoundly complex. When we know that more than 80% of accidents are not reported to the police, that drivers would not likely admit crashing as a result of such distraction, and that research has clearly shown that our attention as well as our eyes are reflexively drawn to objects such as DBBs even when we have no interest in them and have a more important task to perform, and that we may well be unaware of attending to them at all, it is little wonder that such epidemiological studies may simply be incapable of adding to our knowledge of the traffic safety impacts of DBBs.

Then again, we have rarely required proof of actual crash causation prior to setting speed limits, restricting in-vehicle mobile telephone use, or even developing current billboard operational and location restrictions. The argument against the control of DBBs because studies to date have not proven a cause and effect relationship between DBBs and crashes is simply spurious. It would seem sufficient to initiate action based on a level of consistency achieved in research. And such consistency is now being achieved.

It is likely that those who feel that no guidance or regulations can be promulgated until we have clear proof of causality will continue to argue that there is insufficient information to take any action in this regard regarding roadside DBBs. But those who think that their job is to do what they can to enhance safety for the traveling public based upon the best available information, now have, in our opinion, access to a strong and growing body of evidence, including evidence from industry supported research, that roadside digital advertising, attract drivers' eyes away from the road for extended, demonstrably unsafe periods of time.

States and local jurisdictions faced with permit applications or challenges to denied permits need to have a sound basis for their decisions. The research underway by FHWA as this is written may begin to provide specific, directed answers to assist these officials in their work. In the interim, these governmental agencies and toll road operators, faced with the need to make such decisions now have, in our opinion, a sufficient and sound basis for doing so.

SECTION 10.

REFERENCES

3M (2005). *Luminance/Sign Brightness.* Selector Toolkit No. BS-8408.

AAAM (2001). The role of driver distraction in crashes: An analysis of 1995-1999 crashworthiness data system data. American Association of Automotive Medicine. http://199.79.179.82/sundev/detail.cfm?ANNUMBER=00923438&STARTROW=91&CFID=179748&CFTOKEN=3509704

Ady, R. (1967). An investigation of the relationship between illuminated advertising signs and expressway accidents. *Traffic Safety Research Review, 3,* 9-11.

Akagi, Y., Seo, T, and Motoda, Y. (1996). "Influence of Visual Environments on Visibility of Traffic Signs." *Transportation Research Record,* No. 1553, pp 52-58. Washington, DC: National Academy Press.

Alexander, G.J., & Lunenfeld, H. (1972). "Satisfying Motorists Need for Information." *Traffic Engineering 43*(1), pp. 46-70, October.

Andersen, C. (2008a). Personal communication.

Andersen, C. (2008b). Personal communication.

Andreassen, D.C. (1984). *Traffic accidents and advertising signs.* Victoria, Australia: Australian Road Research Board.

AUSTROADS (1988). *Guide to Traffic Engineering Practice. Part 8. Traffic Control Devices.*

Beijer, D. D., Smiley, A., & Eizenman, M. (2004). Observed driver glance behavior at roadside advertising. *Transportation Research Record,No. 1899,* 96-103.

Beijer, D.D. (2002). *Driver distraction due to roadside advertising.* University of Toronto, Department of Mechanical and Industrial Engineering.

Bergeron, J. (1996a). "An Evaluation of the Influence of Roadside Advertising on Road Safety." *Document prepared for the Ministere des Transports, Government of Quebec.*

Bergeron, J. (1996b). Road Safety Survey Regarding the Effects of the Billboards that Centre RCA SEC Has Proposed to Install in Proximity to the Ville-Marie Expressway. *Document prepared for the Ministere des Transports, Government of Quebec.*

Black Hammer Productions (Undated). *New York Magazine – Fresh Direct's Digital Billboard Animation.* Accessed at: http://www.blackhammer.com/portfolio/projects/TS/nymag.html

Boersema, T., Zwaga, H.J.G. & Adams, A.S. (1989). Conspicuity in realistic scenes: an eye movement measure. *Applied Ergonomics, 20*(4), 267-273.

Brown, B. (1989). Effects of Distracting Stimuli on Instantaneous Tracking Performance. *Australian Road Research Board Internal Report AIR 459-1.*

Business Editors (2002). AdSpace networks powers North America's largest flat screen outdoor digital billboard. *Business Wire,* December 16th.

Cairney, P., & Gunatillake, T. (2000). *Roadside advertising signs – A review of the literature and recommendations for policy.* ARRB Transport Research. Contract Report for RACV (Royal Automobile Club of Victoria).

Capka, JR. (2005). "Information: Optional Use of Acknowledgement Signs on Highway Rights-of-Way." Washington, DC: FHWA Policy Memorandum.

Chan, E., Pradhan, A.K., Knodler, M.A., Pollatsek, A., & Fisher, D.L. (2008) Evaluation on a Driving Simulator of the Effect of Drivers' Eye Behaviors from Distractions inside and Outside the Vehicle. *Human Factors* (in publication).

Christensen, B. (2006). "French billboards call your cellphone." *Technovelgy.com.* Obtained from the internet at: http://www.technovelgy.com/ct/Science-Fiction-News.asp?NewsNum=622 .

Christensen, B. (2007). "Smart sign watches you drive by." *Technovelgy.com.* Obtained from the internet at: http://www.technovelgy.com/ct/Science-Fiction-News.asp?NewsNum=981

CIE. Publication 111-1994. (Cited in Andersen, 2008a).

City of Flowery Branch, Georgia (2008). Ordinance No. 348-7, Article 24, "Signs."

City of Oakdale (Minnesota) (2008). *Chapter* 25 of the Zoning Code, Article 19, Signs, Sections 25-181 to 25-200.

City of San Antonio, Texas Code of Ordinances Part II, Section IV, Chapter 28, Subsection 28-125, Off-premise digital signs (Undated). Obtained from the Internet at: http://library2.municode.com/default/DocView/11508/1/196/200 on 10/12/08.

Chapman, P., & Underwood, G. (1998). Visual search of driving situations: danger and experience. *Perception 27)*, 951-964.

Clark, O.J., & Davies, S.P. (2007). Ads on the Road: A Study into the Effects of Perceptual Load and Expertise on Reaction Time to Road Signs. Hull, England: University of Hull.

ClearChannelOutdoor
http://www.clearchanneloutdoor.com/products/digital/don/cleveland/index.htm)

Coetzee, J.L. (Undated). *The evaluation of content on outdoor advertisements.* Pretoria, South Africa: Innovative Traffic Solutions (Pty) Ltd.

Cole, G.L. and Hughes, P.K. (1984). "A Field Trial of Attention and Search Conspicuity." *Human Factors,26* (3), pp. 299-313.

County of St. Johns, State of Florida (1999). Ordinance No. 99-35, "Signs."

Crampton, T. (2006). "Where to draw the line when street ads give you a ring." *International Herald Tribune – Technology & Media.* Accessed from the web at: http://www.iht.com/articles/2006/05/07/yourmoney/mobilead08.php .

Crundall, D., Underwood, G., & Chapman, P. (1999). Driving experience and the functional field of view. *Perception (28)*, 1075-1087.

Crundall, D., Van Loon, E., & Underwood, G. (2006). Attraction and distraction of attention with roadside advertisements. *Accident Analysis and Prevention, 38 (4)*, 671–677.

CTC & Associates. (2003). Electronic Billboards and Highway Safety. *Transportation Synthesis Report, Bureau of Highway Operations, Division of Transportation Infrastructure Development, Wisconsin Department of Transportation.*

Department for Communalities and Local Government (DCLG) (2007). Circular 03/2007, Town and Country Planning (Control of Advertisements), cited in Speirs, et al (2008).

Department for Transit (DfT) (2001). *Traffic Signs Manual*, cited in Speirs, et al, 2008.

Dingus, T.A., Klauer, S.G., Neale, V.L., Petersen, A., Lee, S.E., Sudweeks, J., Perez, M.A., Hankey, J., Gupta, S., Bucher, C. Doerzaph, Z.R., Jermeland, J., & Knipling, R. (2006). *The 100 Car Naturalistic Driving Study, Phase II – Results of the 100 Car Field Experiment.* Washington, DC: National Highway Traffic Safety Administration.

du Toit, E.M., and Coetzee, J.L. (2001). Advertising Boards on or Visible from National Roads. *20th South African Transport Conference: Meeting the Transport Challenges in Southern Africa.* (Unpaginated).

Dudek, C.L., Schrock, S.D., & Ullman, B.R. (2007). "License plate and telephone numbers in changeable message sign AMBER alert messages." *Transportation Research Record 1959.* Cited in Dudek, 2008. Available online at: http://trb.metapress.com/content/16vkv54401179h03/fulltext.pdf

Dudek, C.L. (2008). "Changeable Message Sign Displays During Non-Incident, Non-Roadwork Periods: A Synthesis of Highway Practice." *NCHRP Synthesis 383.* Washington, DC: Transportation Research Board.

Dunthorne, A. (1982). *The Luminance of Traffic and Advertising Signs –a Comparison of Standards.* Public Lighting Journal, Institution of Lighting Engineers, Rugby, England.

Edquist, J. (2009a). *Visual Clutter in the Road Environment.* Human Factors Workshop Presentation. Washington, DC: Transportation Research Board 88th Annual Meeting.

Edquist, J.(2009b). *The effects of visual clutter on driving performance.* Victoria, Australia: Monash University Accident Research Centre. Available online at: http://arrow.monash.edu.au/hdl/1959.1/64951 .

Eriksen, B.A., & Eriksen, C.W. (1974). Effects of noise letters upon the identification of a target letter in a nonsearch task. *Percept. Psychophys. (16)*, 143-149.

Farbry, J., Wochinger, K., Shafer, T., Owens, N, and Nedzesky, A. (2001). Research review of potential safety effects of electronic billboards on driver attention and distraction (Final Report). Federal Highway Administration, Washington, DC.

FHWA (1998). *Older driver highway design handbook.* Publication No. FHWA-RD-97-135. Washington, DC: U.S. Department of Transportation, Federal Highway Administration.

Finnish Road Administration (2004). *Effects of Roadside Advertisements on Road Safety.* Helsinki: Finnish Road Administration, Finnra Internal Reports 25/2004.

Fisher, D. (2009). Presentation to the Human Factors Workshop on Visual Clutter in the Road Environment. Washington, DC: Transportation Research Board 88th Annual Meeting.

Garvey, P.M. (1996). "What message are you sending? Improving sign visibility." Paper presented at the ATSSA 26th Annual Convention and Traffic Expo.

Garvey, P.M., Thompson-Kuhn, B., & Pietrucha, M.T. (1995). *Sign Visibility Literature Review: Final Report No. PTI 9604.* University Park, PA: Pennsylvania Transportation Institute, The Pennsylvania State University.

Gasson, A.J., & Peters, G.S. (1965). The effect of concentration upon the apparent size of the visual field in binocular vision. *The Optician 148,* 660-665; *149,* 5-12.

Green, M. (2006). Is the moth effect real? *Accident Reconstruction,* May/June, pp. 18-19.

Guerra, R.D. & Braga, M.G.deC. (1998). "Guidelines for the display of advertising signs within the road reserve in Brazil." *Transport Policy(5).* 127-137.

Halsted, C.P. (1993). "Brightness, luminance, and confusion." *Information Display,* March.

Hanowski, R. (2009) *Studying Driver Distraction with Naturalistic Driving.* Presentation to the TRB Human Factors Workshop on Visual Clutter, January 11th.

Hendricks, D.L., Fell, J.C., & Freedman, M. (1999). *The relative frequency of unsafe driving acts in serious crashes.* DTNH22-94-C-05020. Washington, DC: National Highway Traffic Safety Administration.

Holahan, C.J. (1979). *An Evaluation of the Utilization of Psychological Knowledge Concerning Potential Roadside Distracters.* Research Report 64, Texas Office of Traffic Safety. Austin: The University of Texas at Austin.

Holahan, C.J., Culler, R.E., & Wilcox, B.L. (1978). Effects of visual distraction on reaction time in a simulated traffic environment. *Human Factors, 20*(4), 409-413.

Horrey, W. J., and Wickens, C. D. (2007). In-vehicle glance duration: Distributions, tails and a model of crash risk. *Proceedings of the 2007 Transportation Research Board Meeting.* Washington, DC: TRB. http://hmil.cs.drexel.edu/papers/CSC02.pdf.

IESNA. Report No. RP-19-01. (Cited in Andersen, 2008a).

Johnson, A. & Cole, B. (1976). Investigations of Distraction by Irrelevant Information. *Australian Road Research, 6*(3), pp. 3-23.

Kempton, W. (2008). Letter to The Honorable Mary E. Peters, Secretary of Transportation, August 27.

Klauer, S.G., Neale, V.L., Dingus, T.A., Ramsey, D, & Sudweeks, J. (2005). Driver inattention: A contributing factor to crashes and near-crashes. *Proceedings of the Human Factors and Ergonomics Society 49th Annual Meeting,* 1922-1926. Santa Monica, California: Human Factors and Ergonomics Society.

Klauer, S.G., Dingus, T.A., Neale, V.L., Sudweeks, J.D. and Ramsey, D.J. (2006a). The Impact of Driver Inattention on Near-Crash/Crash Risk: An Analysis using the 100-car Naturalistic Driving Study Data. Washington, DC: *National Highway Traffic Safety Administration Report No. DOT HS 810 594.*

Klauer, S.G., Sudweeks, J., Hickman, J.S., & Neale, V.L. (2006b). *How Risky is it? An Assessment of the Relative Risk of Engaging in Potentially Unsafe Driving Behaviors.* Washington, DC: AAA Foundation for Traffic Safety.

Kuhn, B.T. (1999). The impact of illumination on typical on-premise sign visibility. *ITE Journal (69)*1, 64.

Lansdown, T.C. (2004). Considerations in Evaluation and Design of Roadway Signage from the Perspective of Driver Attentional Allocation. In: *The Human Factors of Transport Signs,* C. Castro and T. Horberry, Eds. Boca Raton, FL: CRC Press

Lazarus, J. (2008). *Literature review: The use of commercial advertising on large scale electronic billboards for highways and their relation to driver safety and driver distraction.* Salem: Oregon Department of Transportation Research Unit.

LED Wheels – Graffix Communications (2004). Website accessed at: http://www.ledwheels.com

Lee, S.E., Olsen, E.C.B., & DeHart, M.C. (2003). *Driving performance in the presence and absence of billboards* (Executive Summary). Virginia Tech Transportation Institute, Center for Crash Causation and Human Factors.

Lee, S.E., McElheny, M.J. & Gibbons, R. (2007). *Driver performance and digital billboards: Final Report.* Prepared for Foundation for Outdoor Advertising Research and Education. Virginia Tech Transportation Institute, Center for Automotive Safety Research.

Lehtimaki, R. (1974). *The effect of billboards (roadside advertising) on traffic safety.* (Translated from the original Finnish). Helsinki: Liikenneturva.

Lighting Research Center, Rensselaer Polytechnic Institute, (RPI) 2008. *Technical Memorandum: Evaluation of Billboard Sign Luminances.* Prepared for New York State Department of Transportation.

Lloyd, M. (2008). Personal communication.

Logan, G.D. (1996). The CODE theory of visual attention: an integration of space-based and object-based attention. *Psychol. Rev. (103)* 603-649.

Luoma, J. (1984). *Do advertising signs decrease traffic safety?* (Translated from the original Finnish). *Liikenne, 2*(2), 34-37.

Luoma, J. (1988). Drivers' eye fixations and perceptions. In A.G. Gale, M.H. Freeman, C.M. Haslegrave, P. Smith and S.P. Taylor (eds.), *Vision in Vehicles-II*, 231-237. Amsterdam: North Holland.

Malone, J.L. (1996). "Legal Opinion on the Erection of Billboards on The Right-of-Way of an Interstate Highway by a State." *FHWA Policy Memorandums – Manual on Uniform Traffic Control Devices.* December 19th.

Manual on Uniform Traffic Control Devices. Washington, DC: U.S. Department of Transportation, Federal Highway Administration, 2003. Available at: http://mutcd/fhwa.dot.gov/ .

Marocco, M. (2008a). Letter transmitting "Outdoor Advertising Regulations – 17 NYCRR Part 150), April 15.

Marocco, M. (2008b). Letter transmitting "Outdoor Advertising Regulations – 17 NYCRR Part 150), July 18.

Martens, M. (2009). "Conceptual Guidelines for Roadside Distractions" Presentation to the Human Factors Workshop on Visual Clutter in the Road Environment. Washington, DC: Transportation Research Board 88th Annual Meeting.

Martinovich, S. (2008). Letter to Ms. Susan Klekar, Nevada Division Administrator, Federal Highway Administration, October 10.

Michigan State Highway Department (1952). *Accident Experiences in Relation to Road and Roadside Features.* Lansing, Michigan: Author.

Miller, J.R. (2009). "Hackers crack into Texas road sign, warn of zombies ahead." *Fox News.* Accessed at: http://www.foxnews.com/story/0,2933,484326,00.html

Minnesota Department of Highways (1951). *Minnesota Rural Trunk Highway Accident, Access Point and Advertising Sign Study.* Minneapolis, Minnesota: Author.

Molino, J.A., Wachtel, J., Farbry, J.E., Hermosillo, M.B., & Granda, T.M. (2009) "The effects of commercial electronic variable message signs (CEVMS) on driver attention and distraction: An update." Report No. FHWA-HRT-09-018. Washington, DC: US Department of Transportation, Federal Highway Administration.

Mourant, R.R., & Rockwell, T.H. (1970). Mapping eye movement patterns to the visual scene in driving: An exploratory study. *Human Factors 12*(1), 81-87.

Muttart, J., Fisher, D.L., Knodler, M., & Pollatsek, A. (2007). Driving simulator evaluation of driver performance during hands-free cell phone operation in a work zone: Driving without a clue. *Transportation Research Record, 2018,* 9-14.

New York State Department of Transportation (NYSDOT), 2008a). *Proposed Criteria for Regulating Off-Premise Changeable Electronic Variable Message Sings (CEVMS) in New York State – Draft.* April 11.

New York State Department of Transportation (NYSDOT), 2008b). *Criteria for Regulating Off-Premise Changeable Electronic Variable Message Sings (CEVMS) in New York State – Draft.* July 14.

Noyce, D.A., & Bentzen, B.L. (2005). Determination of pedestrian push-button activation duration at typical signalized intersections. *Transportation Research Record: Journal of the Transportation Research Board, 1939,* 63-68.

Olsson, S. & Burns, P.C. (2000). "Measuring Driver Visual Distraction with a Peripheral Detection Task." Obtained from August 2000 The National Highway Traffic Safety Administration Driver Distraction Internet Forum on the World Wide Web.

OAAA (2008). *Digital Technology Billboards Today – Technology with a Purpose.* Washington, DC: Outdoor Advertising Association of America, Inc.

OAAA (Undated a). *Regulating Digital Billboards.* Washington, DC: Outdoor Advertising Association of America, Inc.

OAAA (Undated b). *State Changeable Message Chart – Source: OAAA State Statute Matrix.* Washington, DC: Outdoor Advertising Association of America, Inc.

OAAA (Undated c). "Brightness Criteria." Obtained from the web at:

Perception Research Services, Inc. (1983). *The Visibility Achieved by Outdoor Advertising: A Comprehensive Evaluation.* Washington, DC: Outdoor Advertising Association of America, Inc.

Peters, M.E. (2003). "Information: Interim Policy on Acknowledgment Signs on Highway Rights-of-Way." FHWA Policy Memorandums – Manual on Uniform Traffic Control Devices. October 29th.

Pottier, A. (1988). Influence of the Conspicuous Nature of Road Signs, on the Surroundings and of the Functional Field of Vision to Facilitate their Observation. *Proceedings of the International Ergonomics Association 10th International Congress,* (pp. 581-583). Sidney, Australia.

PPG (1992). *Outdoor Advertising Control.* PPG19 (cited in Speirs, et al (2008).

Prentice, (1999). "New outdoor study reveals how people react to billboards: cameras tracked subjects' eye movements." *Media Life.* June. Accessed at: http://archives.medialifemagazine.com/news1999/june99/news3614.html .

Privelege Insurance (2005). Cited in Speirs, et al as: http://www.masterquote.co.uk/news/Car-Insurance-News-Story~id~15095396.html .

Rahimi, M., Briggs, R. and Thorn, D. (1990). A Field Evaluation of Driver Eye and Head Movement Strategies toward Environmental Targets and Distracters. *Applied Ergonomics*, *21*(4), pp. 267-274.

Road Safety Committee (2006). Inquiry into Driver Distraction - Report of the Road Safety Committee on the Inquiry into Driver Distraction. *Parliamentary Paper No. 209 Session 2003-2006.* Victoria, Australia: Parliament of Victoria.

Rockwell, T.H. (1988). Spare visual capacity in driving-revisited: New empirical results for an old idea. *Vision in Vehicles II.* A.G. Gale et al., Editors. Elsevier Science Publishers BV.

South African National Roads Agency Limited (SANRAL) (2000). http://www.its-traffic.co.za/publications/SANRAL%20face%20evaluation%20presentation.pdf

Schieber, F., & Goodspeed IV, C.H. (1997). *Nighttime Conspicuity of Highway Signs as a Function of Sign Brightness, Background Complexity and Age of Observer.* Washington, DC: Federal Highway Administration.

Schimmoller, V.F. (2001). "Information: Adopt-a-Highway Signs – Interpretation (II-477(I) – "Advertising on Adopt-a-Highway Signs"). *FHWA Policy Memorandums – Manual on Uniform Traffic Control Devices.* April 27th.

Sculley, S. (2009). "Digital Sign Ordinance – Temporary Pilot Program Update." City of San Antonio, City Manager's Office, Interdepartmental Correspondence Sheet.

Shinar, D. (2007). *Traffic Safety and Human Behavior.* Amsterdam: Elsevier

Shurr, K.S., Spargo, B.W., Huff, R.R. & Pesti, G. (2005). Predicted 95th percentile speeds on curved alignments approaching a stop. *Transportation Research Record: Journal of the Transportation Research Board,* No. 1912, 1-10. Washington, DC: TRB.

Simpson, D. (2008). Personal communication.

Skeen, D. (2007). "Eye-tracking device lets billboards know when you look at them." *Wired,* June 12th.

Slobodzian, J. (2007) "Digital billboards coming this way." *Philadelphia Inquirer, E01,* August 21st.

Smiley, A., Persaud, B., Bahar, G., Mollett, C., Lyon, C., Smahel, T., & Kelman, W.L. (2005). Traffic Safety Evaluation of Video Advertising Signs. *Transportation Research Record: Journal of the Transportation Research Board,* No. 1937, pp. 105-112. Washington, DC: TRB.

Smiley, A., Smahel, T., and Eizenman, M. (2004). Impact of Video Advertising on Driver Fixation Patterns. *Transportation Research Record 1899,* 76-83.
Stutts, J.C., Reinfurt, D.W., Staplin, L., & Rodgman, E.A. (2001) The Role of Driver Distraction in Traffic Crashes. Report Prepared for AAA Foundation for Traffic Safety, Washington, DC.

Speirs, S., Winmill, A., & Kazi, T. (2008). *The Impact of Roadside Advertising on Driver Distraction: Final Report.* Basingstoke, Hampshire, England: WSP Development and Transportation.

St. Croix County Planning and Zoning Department (2007). *St. Croix County Code of Ordinances – Land Use and Development – Subchapter VI, Section 17.65, Sign Regulation.* Hudson, Wisconsin. Author. (Accessed from the web at www.co.saint-croix.wi.us

SWOV (2006). *Fact sheet Advertising and information alongside the road.* Leidschendam, The Netherlands: SWOV Institute for Road Safety Research.

Tantala, M.W. & Tantala, P.J. (2005). *An examination of the relationship between advertising signs and traffic safety.* Paper presented at the 84th Annual Meeting of the Transportation Research Board. Washington, DC: National Academy Press.

Tantala, A.M. & Tantala, M.W. (2007). *A study of the relationship between digital billboards and traffic safety in Cuyahoga County, Ohio.* Washington, DC: The Foundation for Outdoor Advertising Research and Education (FOARE).

Tantala, M.W. (2007). Letter to John P. Campbell, P.E. Director, Right-of-Way Division, Texas Department of Transportation. December 5th.

TERS (2002). "Guide to the Management of Roadside Advertising, Edition 1.0." *TERS Product No. 80-500.* Queensland Government, Department of Main Roads.

The Port Authority of New York and New Jersey (2006). "Request for Proposal for the Performance of Expert Professional Services – Safety Review of Proposed Outdoor Advertising Installations." *RFP No. 10335.* June 1st.

The Royal Society for the Prevention of Accidents – cited in Speirs, et al as: http://www.rospa.com/roadsafety/advice/driving/distraction.htm .

Theeuwes, J., Kramer, A.F., Hahn, S., & Irwin, D.E. (1998). "Our eyes do not always go where we want them to go: Capture of the eyes by new objects." *Psychological Science, 9,* 5, 370-385.

Theeuwes, J., Kramer, A.F., Hahn, S., Irwin, D.E., & Zelinsky, G.J. (1999). "Influence of Attentional Capture on Oculomotor Control." *Journal of Experimental Psychology: Human Perception and Performance, 25,* 6, 1595-1608.

Transportation Environment Consultants (TEC), 1989. *Review of Roadside Advertising Signs.* Thornleigh, NSW: Roads and Traffic Authority of NSW.

Treat, J.R., Tumbas, N.S., McDonald, S.T., Shinar, D., Hume, R.D., Mayer, R.E., Stanisfer, R.L., & Castellan, N.J. (1979). *Tri-Level Study of the Causes of Traffic Accidents.* Washington, DC: National Highway Traffic Safety Administration.

Ullman, B.R., Dudek, C.L., Trout, N.D. & Schoeneman, S.K. (2005). *AMBER Alert, Disaster Response and Evacuation, Planned Special Events, Adverse Weather and Environmental Conditions, and Other Messages for Display on Dynamic Message Signs.* Report No. FHWA/TX/-06/0-4023-4. College Station, Texas: Texas Transportation Institute. (Cited in Dudek, 2008). Available online at: http://tti.tamu.edu/documents/0-4023-4.pdf

Vossler, B. (1997). *Burma Shave: The Rhymes, The Signs, The Times.* St. Cloud, MN: North Star Press.

Wachtel, J. and Netherton, R. (1980). *Safety and Environmental Design* Considerations *in the Use of Commercial Electronic Variable-Message Signage*. Report No. FHWA-RD-80-051. Washington, D.C: Federal Highway Administration.

Wachtel, J. (2007). *A Critical, Comprehensive Review of Two Studies Recently Released by the Outdoor Advertising Association of America – Final Report.* Report Prepared for Maryland State Highway Administration Under Project AX137A51. Accessed from the web at: http://www.sha.state.md.us/UpdatesForPropertyOwners/oots/outdoorSigns/FINALREPORT10-18-GJA-JW.pdf .

Wallace, B. (2003a). Driver distraction by advertising: genuine risk or urban myth? *Proceedings of the Institution of Civil Engineers,* Municipal Engineer 156 Issue ME3, 185-190.

Wallace, B. (2003b). *External-to-Vehicle Driver Distraction.* Edinburgh: Scottish Executive Social Research – Transport Research Planning Group.

Webpavement WebBlog (2005). *Outdoor Electronic Billboard Law and Regulation.* http://webpavementblogspot.com .

Weiner, S. (1979) Review of report. Unpublished Internal Memorandum. Washington, D.C.: Federal Highway Administration, Environmental Design and Control Division.

Wierwille, W.W. (1993). Visual and manual demands of in-car controls and displays. In B. Peacock and W. Karwowski (Eds.), *Automotive Ergonomics,* 299-320. Washington, DC: Taylor & Francis.

Wierwille, W.W. & Tijerina, L. (1998). Modeling the relationship between driver in-vehicle visual demands and accident occurrence. *Proceedings of the Sixth International Conference on Vision in Vehicles.* In A.G. Gale, I. D. Brown, C.M. Haslegrave and S.P. Taylor, (Eds.) Elsevier Science Publishers BV.

Wikman, A., Nieminen, T., & Summala, H. (1998). Driving experience and time-sharing during in-car tasks on roads of different width. *Ergonomics, 4242*(3), 358-372.
Wikipedia contributors. (2009). "Burma-Shave," *Wikipedia, The Free Encyclopedia,* http://en.wikipedia.org/w/index.php?title=Burma-Shave&oldid=279112992 .

Wildervanck, C. (1989). De berm als reclamemedium? In: *Verkeerskunde (41)*1, 12-13.

Wisconsin Department of Transportation District 2, Freeway Operations Unit (1994). *Milwaukee County Stadium Variable Message Sign Study: Impacts of an Advertising Variable Message Sign on Freeway Traffic*

Wojdyla, B. (2009). "How to hack an electronic road sign." *Jalopnik.com. Accessed at:* http://jalopnik.com/5141430/how-to-hack-an-electronic-road-sign

Young, E. (1984). "Visibility achieved by outdoor advertising." *Journal of Advertising Research 24*(4), 19-21.

Young, K., & Regan, M. (2005). Road Safety Implications of Driver Distraction. In *Australasian Road Safety Handbook, Volume 2,* pp. 92-100. Sydney: Austroads

Young, M.S., & Mahfoud, J.M. (2007). Driven to Distraction: Determining the Effects of Roadside Advertising on Driver Attention. *Final report of a Study Funded by The Rees Jeffreys Road Fund.* West London: Brunel University.

Zeigarnik, B.V. (1967). "On finished and unfinished tasks." In W.D. Ellis (Ed.) *A sourcebook of Gestalt psychology.* New York: Humanities Press.

Zillmer, K. (2008). Oakdale ready for latest billboards – City passes dynamic sign ordinance. *Oakdale Lake Elmo Review.*

Zwahlen, H.T. (1988). *Safety aspects of cellular telephones in automobiles. (Paper No. 88058).* Paper presented at the International Symposium on Automotive Technology and Automation (ISATA), Florence, Italy.

ATTACHMENT "J"

City of Minnetonka Report

City Council Agenda Item #14_
Meeting of June 25, 2007

Brief Description: An ordinance regulating dynamic signs.

Recommended Action: Adopt the ordinance.

Background

The city council and planning commission discussed the regulation of dynamic signs at its study session on May 14, 2007. Staff has prepared an ordinance incorporating the direction from that meeting. The major issues are discussed below.

In formulating the proposed ordinance, staff consulted with SRF Consulting and Gerald Wachtel, a national expert on changeable message signs. Their final report is attached on pages A1-A42.

General Framework

The easiest approach to dynamic signs, from both a legal and enforcement standpoint, is to either prohibit all of them or allow them with no restrictions. Instead, the ordinance incorporates a balanced approach to dynamic sign regulation that protects community interests, while recognizing the need to reasonably accommodate evolving sign technologies.

The term "dynamic" display is defined in the ordinance to identify all displays that have changing messages, regardless of the means. By avoiding descriptions that identify the type of change, such as "electronic," the ordinance can better deal with future technologies that have not yet been developed. This approach also recognizes that changing messages by any means can be distracting to the driving public.

Signs are a form of "speech" protected by federal and state constitutions. As a result, cities must be very careful that sign regulations generally do not discriminate on the basis of message content. It can be a challenge to defend an ordinance that draws fine distinctions when allowing certain kinds of signs to be dynamic while prohibiting others.

Accordingly, the dynamic sign provisions will "overlay" the city's existing sign regulations. There would be no change to the existing standards regarding such things as zoning, number, size, and location. As a general matter, the dynamic regulations would apply equally to all signs, with few distinctions between zoning districts or between on- and off-premise signs.

Although residential districts are deserving of more protection than other zoning districts, that is taken into account in the underlying regulations. Additionally, there are

Used with permission of the City of Minnetonka.

uses in residential districts that could benefit from having changing messages, such as churches, schools and government offices. The ordinance allows dynamic signs for conditionally permitted uses in residential districts and for all uses in other districts. Through controls the potential impacts can be addressed by appropriate restrictions, which are discussed below.

The ordinance does not include any spacing requirements. Spacing restrictions could result in unequal treatment of property owners, since the first property owner to install a dynamic sign could prevent the neighboring property owner from also having a dynamic sign. This would be unfair, and could actually increase the frequency of such uses by creating an incentive for nearby property owners to race each other to convert their signs.

The only location requirement is that dynamic messages are limited to pylon and monument signs. Dynamic messages would not be permitted on building signs.

Operational Mode

Dynamic signs have the capability of operating in many different modes, ranging from static messages to scrolling text to full motion video. These operational modes have obvious implications for the distracting nature of dynamic signs.

The city's consultants concluded that there can never be definitive proof of a causal connection between dynamic signs and highway accidents. This is because state-of-the-art driving simulators cannot truly simulate real-life conditions. Further, controlled roadway studies cannot be performed, because controlled roadways can not be filled with hundreds or thousands of cars operating under normal conditions. Finally, eye movement studies use a very limited pool of test subjects who are operating under circumstances that are designed to avoid accidents.

Nevertheless, the studies performed to date provide important insight. For example, some studies indicate how drivers tend to react to signs in different settings, while other studies inform how different degrees and types of distraction are associated with accidents. By considering those individual pieces together, the city can thoughtfully evaluate the risks posed by dynamic signage.

Studies do show that there is a correlation between moving signs and the distraction of highway drivers. An eye movement study showed that changing signs may distract drivers by as much as two seconds. The Federal Highway Administration has determined that being distracted for two seconds or more can result in traffic accidents.

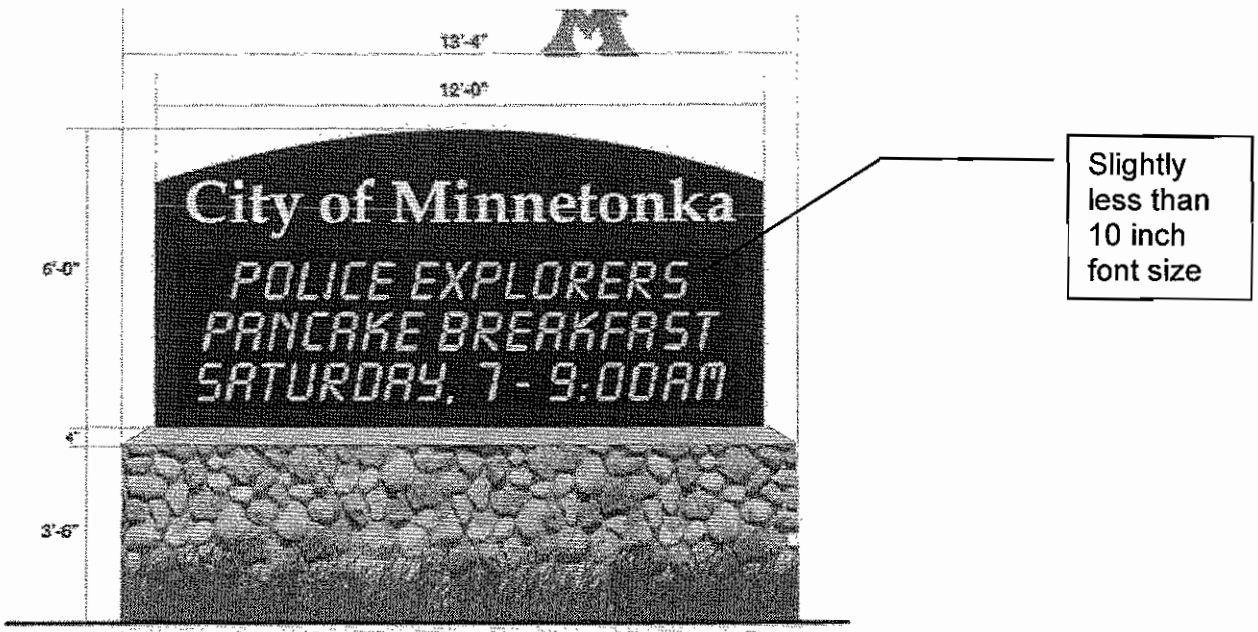
Drivers can be distracted not only by a changing message, but also by knowing that the sign has a changing message. Drivers may watch a sign waiting for the next change to occur. Drivers are also distracted by messages that do not tell the full story in one look.

An example is a scrolling sign - people have a natural desire to see the end of the story, and will continue to look at the sign in order to wait for the end.

The consultants also concluded that drivers are more distracted by special effects used to change the message, such as fade-ins and fade-outs. Finally, drivers are generally more distracted by messages that are too small to be clearly seen or that contain more than a simple message.

In response to these conclusions, the ordinance allows only static displays. No animation, motion or video would be permitted. Additionally, the message change would have to be instantaneous, without any distracting effects, such as dissolving, spinning or fading. Sequential messages, such as a two-stage message for a single product, service or business, would also be prohibited. This would apply whether the sequential messages are on the same sign or multiple signs.

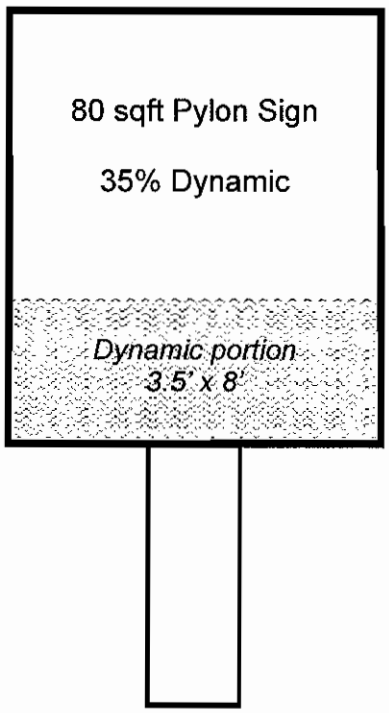
The ordinance also requires a minimum font size to avoid messages that are too small to easily read or that contain too much information. The required minimum is seven inches on a road with a speed limit between 25 and 34 miles per hour, nine inches on a road with a speed limit of 35 to 44 miles per hour, 12 inches on a road with a speed limit of 45 to 54 miles per hour, and 15 inches on a road with a speed limit of 55 miles per hour or more. These are the recommended heights given in Issue 51 (2007) of *Signline*, a publication of the International Sign Association. As an example, the city's changeable message sign has a font size of slightly less than 10 inches for a three-line message and 12 inches for a two-line message:



Monument ID Sign - Double Face Illuminated Sign with LED Message Center

The ordinance provides that if the allowed portion of the sign is too small to meet this minimum size, then no dynamic display is allowed.

Size of Dynamic Portion

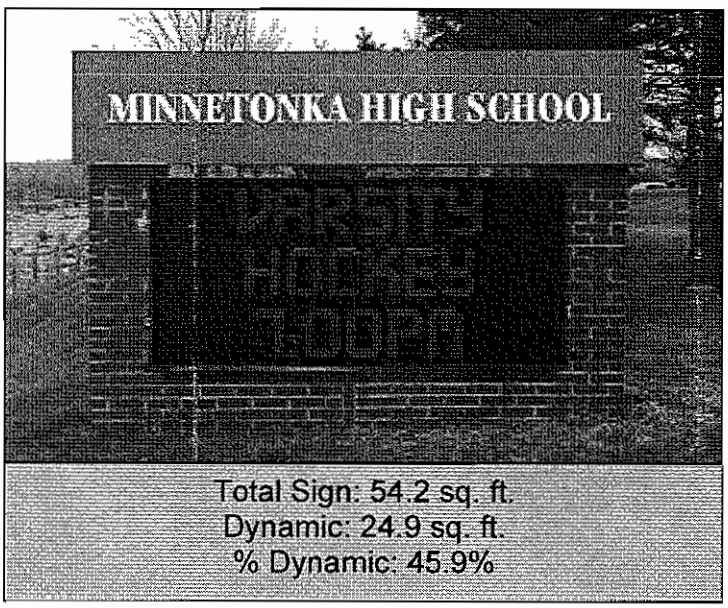


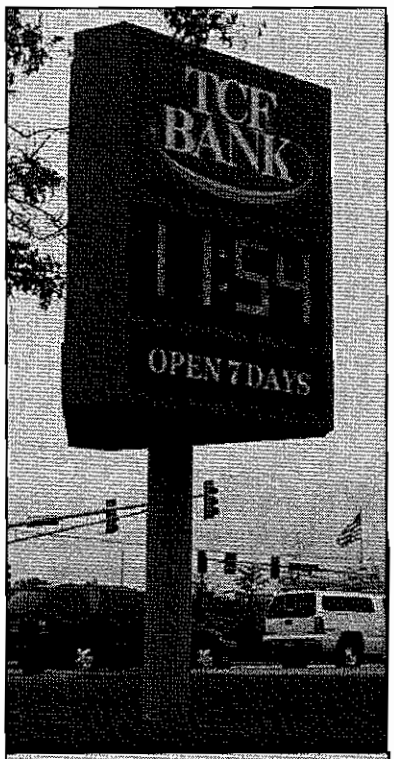
One objective of dynamic sign regulation is the prevention of driver distraction. Public safety is also protected by ensuring that people can find their way to where they want to go. If "way-finding" is compromised, driving conduct can be adversely affected by last-second lane changes or turns, which could result in traffic accidents.

A significant portion of permitted signs should remain constant, so that identity and location can be more readily determined. This way-finding purpose should be given significantly more weight than any advertising purpose of a dynamic message. Limiting the amount of sign face that can be dynamic also serves aesthetic and public safety purposes by discouraging the proliferation of multiple changing signs and reducing exposure to the public.

Staff recommended at the study session that no more than 35 percent of the message area of a permitted sign could contain a dynamic message. This favors way-finding over advertising by a 2:1 factor. There was some concern expressed that this would not be enough room in all situations.

The following show some existing signs in the city:





Total Sign: 70 sq. ft.
Dynamic:16.5 sq. ft
% Dynamic: 23.6%
(*approximate)

Total Sign: 57 sq. ft.
Dynamic: 8.6 sq. ft
% Dynamic: 15.1%

The proposed ordinance continues to include the 35 percent maximum because this provides a reasonable amount of space for the new technology while giving a 2:1 preference to the primary objective of providing a permanent message that allows property owners to identify their locations and citizens to find intended destinations.

The ordinance also provides that the remainder of the sign cannot have dynamic capabilities even though not used. This is needed to ensure compliance. It also provides that there can be only one dynamic display on a sign.

Minimum Display Time

Because there is no ban on dynamic signs and no spacing requirements, the minimum display time becomes critical. If the display time is too short, a driver could be subjected to a view that appears to have constant movement. This impact would obviously be compounded in a corridor with multiple signs.

If dynamic signs become pervasive and there are no meaningful limitations on each sign's ability to change frequently, drivers may be subjected to an unsafe degree of distraction and sensory overload. Accordingly, a longer display time is appropriate.

The ordinance establishes a minimum display time of 20 minutes, which is the standard adopted by the city of Bloomington following its own thorough study. This is less than the one-hour display time that is currently in effect through the district court's temporary injunction, and thus provides greater flexibility to sign owners. There would be an exception for time and temperature signs, which the federal court has recognized as a legitimate exception to limitations on variable message signs. The ordinance provides that a display of time, date, or temperature must remain for at least 20 minutes before changing to a different display, but the time, date, or temperature information itself may change no more often than once every three seconds.

The ordinance provides that each sign must be designed to freeze the device in one position if a malfunction occurs. The displays must also be equipped with a means to immediately discontinue the display if it malfunctions, and the sign owner must immediately stop the dynamic display when notified by the city that it is not complying with the standards of this ordinance.

Brightness Levels

The consultants determined that the brightness of signs can be distracting, and if very bright, can actually result in a "blinding" effect, particularly at night. Pure white light appears the brightest, and has the most blinding capability.

Unfortunately, there is currently no good way to measure the brightness of signs in the field. Sign manufacturers can measure the light emitted by LED signs in a controlled factory setting by measuring the "nit" level, but those conditions cannot be re-created in actual field conditions. Additionally, the instruments used to measure brightness are currently very expensive.

With no good way of measuring brightness, the ordinance incorporates the general standard adopted by the Wisconsin Department of Transportation: "No [sign] may be illuminated to a degree of brightness that is greater than necessary for adequate visibility." The general philosophy is that dynamic signs should have the same appearance as regular signs both during the day and at night. Additionally, the ordinance contains two other general standards found in Indiana and Ohio regulations, which provide:

> No sign may be of such intensity or brilliance as to impair the vision of a motor vehicle driver with average eyesight or to otherwise interfere with the driver's operation of a motor vehicle.

> No sign may be of such intensity or brilliance that it interferes with the effectiveness of an official traffic sign, device or signal.

The ordinance includes a process that allows city staff to make the initial determination, but allows a sign owner to appeal this determination to an independent panel. The appeal panel would consist of one person selected by the city, one person selected by the sign owner, and one person selected by the first two people. This approach was discussed at a meeting with sign industry representatives and appears to be generally acceptable.

The ordinance currently does not prohibit the use of pure white light, but staff is hopeful that industry representatives will help staff define that term.

Application to Existing Signs

The ordinance provides that existing dynamic displays must comply with the operational standards. An existing dynamic display that does not meet the percent of sign face requirement may continue as a non-conforming development. An existing dynamic display that cannot meet the 10 inch minimum size requirement must use the largest size possible for one line of copy to fit in the available space.

Incentives

The ordinance also includes incentives to encourage the removal of non-conforming outdoor advertising signs. The advent of dynamic technology creates an important community planning opportunity. A single dynamic sign can serve the function otherwise performed by multiple traditional billboards. Thus, outdoor advertising companies ought to be encouraged to use dynamic sign displays to consolidate such activities in appropriate locations while removing traditional billboards from areas where large signs are not appropriate.

The city of Minnetonka previously made a determination that off-premise signs are no longer allowed in the city because they are inherently distracting and do not serve the need of property owners to identify themselves and their businesses. Those signs remain now as non-conforming uses. State and federal laws severely limit the city's ability to require the removal of those signs.

The ordinance allows an off-premises sign to use 100 percent of the message area for dynamic messages and an eight-second message display time if the owner removes two other off-premise signs and commits to keep another sign without dynamic displays, subject to certain minimum size and other conditions. This trade would offset the distraction of a larger message area by removing the inherent distraction from another sign and would reduce the number of non-conforming signs in the city. Because outdoor advertising signs do not have the need for on-premises identification and also will not proliferate since they are not allowed, this approach appears appropriate.

Public Comments

At the writing of this report, the city had received comments about the proposed ordinance from Clear Channel Outdoor and from Roger Brown of Daktronics (see pages A55-56), a manufacturer of dynamic signs. The following summarizes Clear Channel's comments and staff's responses:

1. It is inappropriate to say that outdoor advertising signs are distracting when the city's own consultants have concluded that there can never be definitive proof of a causal connection between dynamic signs and highway accidents.

   Response: This comment does not recognize that there are two different concepts. No single study has conclusively proven that a particular dynamic display caused particular traffic accidents that otherwise would not have occurred. Because of the number of variables involved and the impossibility of recreating all of them in a laboratory-type setting, that level of proof is impossible. However, studies performed thus far provide more than sufficient support for the city to conclude that outdoor advertising signs are, in fact, distracting to drivers, and that distractions can lead to traffic accidents.

2. The company usually occupies property as a tenant, and it may not have the authority to excavate to remove foundations.

   Response: The city requires that foundations be removed as part of all other demolition permits. This is done to protect public safety (from tripping over them) and to avoid problems in the future.

3. The surrender of the state permit should be required upon removal of the sign, not upon issuance of the enhanced dynamic display permit.

   Response: This makes sense, and the change has been made in the ordinance. An additional sentence is added that provides that the enhanced dynamic display cannot begin to operate until proof is provided that the state permit has been surrendered.

4. An enhanced dynamic display permit requires the sign company to commit to never put a dynamic display on another existing sign. What happens if that existing sign is subsequently removed?

   Response: Subsequent events do not affect the permit. The permit is judged by the circumstances existing at the time the permit is issued. Language was added to the ordinance to clarify this.

5. The brightness standard of "adequate visibility" may be interpreted to mean a bare minimum when in fact a sign that is too dim may also be distracting because people strain to read it.

   Response: In an attempt to avoid this unintended interpretation, staff has added two words requested by the company: "No sign may be brighter than is necessary for ***clear and*** adequate visibility."

The following summarizes Mr. Brown's comments and staff's responses:

1. Signs are expensive and it is unlikely that there will be many area with multiple dynamic signs.

   Response: As technology advances, these signs will become less and less expensive, just like home computers. This trend has already begun. As Daktronics said last year in its 10-Q filing with the Securities and Exchange Commission, its revenues on the sales of its digital displays to outdoor advertising companies has increased in part because of the lower cost of displays.

2. There is no reason to give off-premises signs a shorter duration time than on-premise signs. Logically the opposite is true because off-premises signs are usually larger.

   Response: As a general rule, the ordinance is not making any distinction between off- and on-premise signs. However, the ordinance provides a shorter duration as an incentive to eliminate billboards on nearly a 2 to 1 basis and to prohibit dynamic displays on an additional billboard. The city is getting significant public safety enhancements in return for these concessions from the off-premise sign owner. On-premise sign owners are in no position to offer the City the same benefits for that privilege.

3. On-premise signs are smaller and may need multiple frames to communicate most messages.

   Response: Studies show that drawn-out messages (such as sequential messages) are more distracting than unrelated messages, and the ordinance will not allow them. There is still a reasonable opportunity to provide a concise message.

4. The percent of the sign face and a minimum font size unrelated to distance will make the ability to communicate a message with one frame virtually negligible.

   Response: Photos in the staff report show examples of existing signs that meet the percent and font size requirements. The font sizes incorporated into the

ordinance are recommendations directly from the International Sign Association, whose motto is "supporting, improving, and promoting the sign industry."

5. An exception for time and temperature signs is not legal because it is based on content. City staff has misread the law.

   Response: The 8th Circuit Court of Appeals specifically allowed an exception for time and temperature signs in La Tour v. City of Fayetteville, 442 F.3d. 1094, 1097 (8th Cir. 2006): "We agree with the district court that, because a message displaying the time and/or temperature is short and rudimentary, such a message poses less of a traffic hazard than other messages. In light of all of these reasons, we find the Ordinance to be content-neutral."

6. It is not valid to adopt the 20-minute hold time simply because another city did the same thing.

   Response: The reasons for the 20-minute duration time are explained. The fact that another city chose the same period after its own thorough study is support, but not the sole reason, for the result.

7. The Small Business Administration (SBA) has found that sales increase with the use of dynamic signs.

   Response: Even if this is correct, it is not persuasive. Unlike the city, the SBA's goals are marketing and sales, not public safety.

8. A one-second duration is appropriate for an on-premise sign. Animations and video should be allowed in appropriate areas.

   Response: These suggestions are contrary to the findings of the legitimate safety studies.

8. Requiring the name of the business on the sign is also a prohibited content-based regulation.

   Response: The ordinance does not require the name of the business on the sign. The ordinance requires only that a permanent message be on the sign, which we presume will be some kind of an identifying message that will increase the likelihood that citizens can find a destination. The sign owner is free to decide what that message is.

9. The reference to the potential for distraction is not an appropriate basis for regulation. Other things can also be distractions. The studies have found no safety hazard.

   Response: The legitimate studies have found a correlation between dynamic signs and distractions. Those studies have also identified that distractions can

result in accidents. That is enough to justify regulation. Other things may also cause distractions, but the city has no control over them. Moreover, the Supreme Court has repeatedly emphasized that governments need not choose between attacking all facets of a problem (or none at all). The city has the ability to regulate where it can to minimize the amount of driver distractions.

11. An "8 second hold time is appropriate and in line with Federal and State safety studies."

Response: Since December the city, its consultants, and its counsel have been gathering studies that inform the regulation of dynamic signs. Because Mr. Brown's assertion was not borne out by the State and Federal studies that had been collected thus far, we requested Mr. Brown to provide those studies to us. What he provided to us, while voluminous, did not include any Federal and State safety studies that show that an eight-second hold time is appropriate.

- He referenced a 1980 safety study and a 2001 research review performed by or for the Federal Highway Administration. While those documents note that the data was not conclusive when those reports were issued and that there would be value in further research, they provide far more support for the City's position than for Mr. Brown's position (that "there was no correlation between the usage of the signs and traffic safety."). That is why the city (and, in turn, Judge Zimmerman in District Court) relied on each of those documents in the pending civil action, where the court allowed a substantially longer "hold time" (of one hour) than would be allowed under the proposed amendments.

- He has also provided two links to web pages on the site of the Small Business Administration, the contents of which he describes as "that organization's findings regarding EMC safety concerns." These do not appear to be the "findings" of any agency, let alone of an agency with special expertise in traffic safety. The content on the SBA's web pages appears to have been provided by "The Signage Foundation for Communication Excellence, Inc.", an organization that is a joint enterprise between sign industry organizations and the SBA. The purpose of those pages, according to the Foundation's webpage, was "to acquaint small business with the value of on-premise signage." While the page regarding safety cites the 1980 Wachtel and Netherton study, the actual text of that study undermines the assertions on the page, particularly when that study is viewed as a whole. The only other study referenced by the Foundation on the page regarding safety was written by a *former* FHWA official, Richard Schwab. Further investigation shows that the Schwab report was done for the

Foundation itself and the International Sign Association (whose motto is "supporting, improving, and promoting the sign industry.").

- The only state agency document that he provided was not the result of a study in any ordinary sense of the term. It is the two-page MnDOT internal technical memorandum that the plaintiff in the pending litigation tried and failed to rely upon in seeking an order allowing it to resume using a dynamic display with an eight-second interval. It simply reflects the application of a formula for applying state billboard spacing requirements in the context of digital displays. On pages 8-9 of his January ruling, Judge Zimmerman explained the very limited significance of that document. Moreover, Scott Robinson of MnDOT has explained to the city's consultants that the memo is not a Mn/DOT policy, statute or rule, but rather it was written to provide internal guidance.

- Mr. Brown also provided two studies commissioned by the sign industry itself. The first was a study performed for the Outdoor Advertising Association's own foundation, The Foundation for Outdoor Advertising Research and Education, by Suzanne Lee and others at Virginia Tech entitled "Driving Performance in the Presence and Absence of Billboards." The second was "An Examination of the Relationship Between Signs and Traffic Safety," performed by a private consulting firm for the foundation of the United States Sign Council. Neither study focused on digital displays or the special issues that digital displays present. Moreover, the Lee study has been subjected to an extraordinary level of judicial criticism. When rejecting the Lee study's conclusions regarding the supposed absence of a relationship between billboards and traffic safety, a federal judge found that the Lee study "is so infected by industry bias as to lack credibility and reliability." *Nichols Media v. Town of Babylon,* 365 F.Supp.2d 295, 308 (N.D.N.Y. 2005). Following a full trial in which Ms. Lee was cross-examined regarding the report, the court held that "this conclusion is supported not only by industry involvement in the design and execution of the study but also by the lack of peer review and the fact that there is no other scientific study with the same or similar conclusions regarding driver distraction." *Id.* Even if the information in the Tantala Group report were more relevant to digital displays, its genesis has much in common with the Lee study. According to the website of the United States Sign Council "if you're in the sign business, USSC is for you . . . . USSC is managed by sign people for the benefit of sign people."

- Mr. Brown's email also includes a quotation from a "Professor Taylor" at Villanova University, in which he stated that "there appears to be no

reason to believe that changeable message signs represent a safety hazard." Villanova Professor Charles R. Taylor is a Professor of Marketing. His Villanova web biography states that his nonacademic positions include "consulting" for Clear Channel and Eller Media (Clear Channel Outdoor's predecessor), as well as for outdoor advertising company Magic Media. An expert whose expertise is not traffic safety is not qualified to opine on the subject of traffic safety.

Planning Commission Recommendation

On June 14, 2007, the planning commission recommended that the city council adopt the ordinance with modifications. (See the minutes on pages AA57–A65.) During discussion by the commission, it was noted several areas required further consideration:

- Minimum Display Time

The commission felt that there was a need for a definite hold time as to not impact the traveling public; however, they suggested some consideration less than 20 minutes. Staff believes that the hold time is an integral part of the ordinance for at least two reasons. First, from a safety standpoint, it is needed to decrease the tendency (recognized by safety experts) of drivers and pedestrians to stare at signs that they expect to change because, over time, a longer hold time will lower expectations that a sign will change while they are watching it. Second, as dynamic displays become more prevalent (as may occur with on-premise signs in the city), it will be more likely that multiple uncoordinated dynamic displays will be in view at the same time. This will cause one or more distracting changes to be visible every few seconds, thus heightening the distraction. Conversely, the more time between transitions, the less likely multiple signs will cause distraction.

- Maximum Dynamic Portion of Sign

The planning commission further recommended consideration of signage be allowed to have an increased percentage of dynamic area. Staff has recommended a 35% maximum to address wayfinding issues, and secondarily as an aesthetic consideration as it relates to current city characteristics. If the dynamic portion would be allowed to be 50% or above, staff notes the following points of consideration:

Dynamic vs. Wayfinding – An important reason why permits can be issued for on-premise commercial signs (but not off-premise commercial signs) is that, in their customary use, on-premise commercial signs tend to provide a means of finding a location. If the ordinance is changed in a way that makes it relatively easy to temporarily replace the full message of an on-premise sign with another message that wayfinding function would likely be undermined. On-premise signs would more frequently be used for purposes unrelated to wayfinding and more closely related to the purpose of signs no longer permitted in the city (except as grandfathered uses).

However, the sign owner's interest in using its sign for more than wayfinding can often be accommodated. Staff would submit that the dynamic portion of signage should not be outweighed or equal to the wayfinding purpose of signage.

Effects on neighborhood character – In considering these issues, it is important to remember that the proposed amendments would not forbid the placement of dynamic signage in residential districts, and that residential districts are often the home to certain types of conditional uses (such as religious institutions and schools) that are more likely to use dynamic signage, The city must consider effects of signage in areas near neighborhoods or within neighborhoods. Signs in a more urban or densely populated environment, near or visible to existing housing, is a concern. Signs used for conditionally permitted uses, such as religious or educational institutions, could have a direct effect on residential properties. If the dynamic portion of the sign were only one-third of the sign; there is less likelihood for conflicts between land uses.

Corridors of Dynamic Signage – Corridors of dynamic signage must be considered. Whether the sign is located on I-394 or State Highway 7; the potential for a proliferation of dynamic signs is an aesthetic concern. An often cited city goal is to protect the natural environment; staff believes that more dynamic signage allowance is contrary to that goal.

- Clarify "Permanent" portion of the Sign

The planning commission requested that staff review the dynamic portion language to ensure we have properly defined the portion of the sign that would be considered "permanent." Staff has reviewed the definition of dynamic and finds that the definition is complete in describing the aspects of signage that are at issue. The other portion of the sign, the remaining 65%, may not have dynamic qualities.

Staff Recommendation

Staff recommends continuing the 20 minute hold time and a 35% maximum dynamic sign face. Staff believes that this ordinance constitutes a major change in sign regulation in Minnetonka, which far exceeds the allowances within the current city code. Only dynamic time, temperature, and events are currently allowed by the code. The approach that staff has presented will allow the city to monitor and experience the use of dynamic signage. At a future point, if there is a need to adjust the allowances, the city will have relatable, visual knowledge of the kind of effect this signage produces. Staff further recommends the city council adopt the ordinance found on pages A43-A54.

Submitted through:
John Gunyou, City Manager

Originated by:
Desyl Peterson, City Attorney

Ron Rankin, Community Development Director
Julie Wischnack, AICP City Planner

G:\WORD\CC Items 2007\2007 CC Word Staff Reports\cl97054 Dynamic Signs.07a.DOC

"DYNAMIC" SIGNAGE:

RESEARCH RELATED TO DRIVER DISTRACTION AND ORDINANCE RECOMMENDATIONS

Submitted by

SRF Consulting Group, Inc.

Prepared for

City of Minnetonka

June 7, 2007

TABLE OF CONTENTS

Page No.

1.0 INTRODUCTION 1

2.0 PURPOSE OF STUDY AND METHODOLOGY 1

3.0 SELECTED RESEARCH FINDINGS 2

3.1 Expert Opinions 3

3.2 Billboards: a Source of Driver Distraction? 4

3.3 "Dynamic" Billboards: an Additional Source of Driver Distraction? 6

3.3.1 Other Information 9

3.4 How Much Distraction Is a Problem? 10

3.5 How Does "Brightness" Affect Driver Distraction? 15

3.6 Billboard and Other Signage Regulation: a Minnesota Perspective 16

3.7 Billboard and Other Signage Regulation: Other Perspectives 16

4.0 SUGGESTED REGULATORY APPROACH 19

4.1 Definitions 19

4.2 Types of Regulatory Measures 19

4.2.1 Complete or Partial Prohibition of Electronic Signs 19

4.2.2 Size Limitations on Electronic Signs 20

4.2.3 Rate-of-Change Limitations on Electronic Signs 20

4.2.4 Motion, Animation, or Video Limitations on Electronic Signs 21

4.2.5 Sign Placement and Spacing 22

4.2.6 Text Size 22

4.2.7 Brightness Limitations on Electronic Signs 23

4.3 Public Review 24

5.0 CONCLUSIONS AND RECOMMENDATIONS 25

Appendix A – Current Sign Technologies
Appendix B – Outdoor Advertising Sign Brightness Definitions
Appendix C – Electronic Outdoor Advertising Device Visual Performance Definitions

LIST OF TABLES

Page No.

Table 1: FHWA Reanalysis of Faustman's Findings 5

Table 2: Crash Causation Summary 11

Table 3: Percentage of CDS Crashes Involving Inattention-Distraction Related Crash Causes 12

Table 4: Specific Sources of Distraction Among Distracted Drivers: 12

Table 5: Telespot Sign Crash Rates - Expressway Southbound 13

Table 6: Telespot Sign Crash Rates-Expressway Northbound 14

Table 7: Number of New Messages Displayed at Various Driver Speeds and Time Intervals Between Messages 21

LIST OF FIGURES

Page No.

Figure 1: VicRoads' Ten Point Road Safety Checklist 18

1.0 INTRODUCTION

This study was precipitated by concerns raised by the City of Minnetonka, Minnesota in regard to the installation of two LED ("light emitting diode") billboards along Interstate 394 and Interstate 494. The LED function was applied to two existing "static" image billboards located adjacent to the interstate. Following installation of the LED function, the City turned off the power to the signs though a stop work order based on current city ordinance prohibiting flashing signs, which is broadly defined, as well as permitting requirements for the retrofitting of the signs to the upgraded technology. The billboard owner sued the City, and the court response to this legal action as of the writing of this study has been to allow limited use of the LED billboards. A moratorium on further signage of this type was established by the City to facilitate the study of issues related to driver distraction and safety and appropriate regulatory measures for LED and other types of changeable signage.

This study was undertaken on behalf of the City of Minnetonka to examine these issues. While the concerns were precipitated by LED billboards in particular, this report examines more broadly "dynamic" display signage which is defined as any characteristics of a sign that appear to have movement or that appear to change, caused by any method other than physically removing and replacing the sign or its components, whether the apparent movement or change is in the display, the sign structure itself, or any other component of the sign. This includes a display that incorporates a technology or method allowing the sign face to change the image without having to physically or mechanically replace the sign face or its components. This also includes any rotating, revolving, moving, flashing, blinking, or animated display and any display that incorporates rotating panels, LED lights manipulated through digital input, "digital ink" or any other method or technology that allows the sign face to present a series of images or displays. These capabilities may be provided by a variety of technologies which are discussed later in this report.

As the study progressed, additional communities within the Twin Cities Metropolitan Area, as well as the League of Minnesota Cities, expressed interest in these issues. However, it is not the intention of this report to provide a comprehensive study of all issues raised by dynamic signage, or other types of billboards, but rather to focus narrowly on the issues of concern to the City of Minnetonka.

2.0 PURPOSE OF STUDY AND METHODOLOGY

Driving a motor vehicle is a complex task that requires the ability to divide one's attention. Simultaneously maintaining a steady and legal speed, changing lanes, navigating traffic and intersections, reading and interpreting street signs, drivers are often challenged by conditions that can change in the blink of an eye. Internal and external physical conditions can affect how safely the driving task is accomplished. Drug or alcohol intoxication, fatigue and/or distractions in the driving environment all can play a role in motor vehicle crashes. However, these conditions are rarely the sole reason for a crash. Rather, these conditions serve to exacerbate an already-complex driving environment and subsequent mistakes in judgment can lead to crashes.

Increasingly complex traffic and roadway environments require greater attention to and focus on the driving task.

The purpose of this study is to understand what existing transportation research tells us about the effects of dynamic signs on motorists. This study also explores regulatory measures enacted in other jurisdictions to address concerns related to driver distraction. Due to time and scope constraints, this report is not comprehensive, but rather addresses the most frequently cited and easily accessible information available. The report concludes with a discussion of regulatory options for the City of Minnetonka to consider in their formulation of policies to address dynamic signage.

Information collected for this report draws from a variety of sources including interviews with subject matter experts, government and academic research, and policies developed to regulate various types of signage.

Several city and county sign ordinances were used as references for policy and regulatory research. In some cases, ordinances were brought to our attention by planners and others following the sign ordinance issue. In others, Internet searches were conducted using words and references that apply specifically to dynamic signs.

Several sign manufacturers and sign companies provided an industry perspective through a workshop with the SRF Consulting Group and the City of Minnetonka staff on February 27, 2007. This meeting yielded information about sign characteristics that can be addressed through policy and regulatory measures. Daktronics, a company that manufactures and markets LED signs, was also helpful in this regard, providing informational materials about characteristics of signs that can be regulated and examples of city sign ordinances with which they are familiar.

3.0 SELECTED RESEARCH FINDINGS

This following section presents a summary of expert opinions and selected driver distraction research conducted by government and academic researchers examining roadside signage and its effects on the driving task. Studies are organized around critical questions with serious research ramifications.

- *Is there reason to believe that billboards are a source of distraction?*
- *Is there reason to believe that "dynamic" billboards are an additional source of distraction?*
- *How much distraction is a problem?*
- *How does "brightness" affect driver safety concerns?*
- *How should billboards and other signage be regulated from a driver safety perspective?*

3.1 Expert Opinions

A combination of researchers and public policy experts were interviewed for this study. Individuals were identified while conducting background research into driver distraction and were interviewed because of their credibility in the field.

Kathleen Harder, a researcher at the University of Minnesota, has conducted driver distraction research for a variety of applications, including research for Mn/DOT. She is an expert in the field of human factors and psychology. She indicated that electronic billboards pose a driver distraction threat because of their ability to display high resolution color images, their ability to change images, and their placement in relationship to the roadway, particularly in areas where the road curves, exits and entrances are present, merges, lane drops, weaving areas, key locations of official signs, and/or areas where roadways divide.

Greg Davis, a researcher with the FHWA Office of Safety Research and Development, in Washington, DC was involved in the 2001 FHWA study on electronic billboards. He was interviewed to gain a deeper understanding of this critical study and to learn of recent research in this area. Davis stated that while no research has established a direct cause and effect relationship between electronic outdoor advertising signs and crash rates, the lack of such a research finding does not preclude a causal relationship between electronic billboards and crashes. He advocated for a new study that can control all variables and determine if a cause and effect relationship exists.

Scott Robinson, an outdoor advertising regulator for Mn/DOT, wrote the 2003 technical memorandum that addresses allowable changes for outdoor advertising devices. Mr. Robinson indicated that the memo was originally written in 1998 to establish a permitted rate of change for tri-vision signs and that the application to electronic billboards was not considered. The minimum change rate of 4.9 seconds for 70 mph roadways and 6.2 seconds for 55 mph roadways was based on the travel time between static signs spaced at the minimum allowed distance apart. Mr. Robinson also indicated that the memo is not a Mn/DOT policy, statute or rule, but rather it was written to provide internal guidance.

Jerry Wachtel, an Engineering Psychologist and highway safety expert in private practice, was the lead author for the FHWA's original (1980) study on electronic billboards. He has continued his active involvement in this field, and advises Government agencies as well as the outdoor advertising industry on sign ordinances, sign operations, and the implications of the latest research on road safety. Mr. Wachtel believes that it is neither feasible from the perspective of research design and methodology, nor necessary from a regulatory perspective, to demonstrate a causal relationship between digital billboards and road safety. Rather, he believes that we have a strong understanding, based on many years of research, of driver information processing capabilities and limitations, and of the contributions to, and consequences of, driver distraction, on crash risk; and that this understanding is sufficient to support development of guidelines and ordinances for the design, placement, and operation of digital billboards so as to lessen their potentially adverse impact on road safety and traffic operations.

Wachtel also offered comments on drafts of this report. In later conversations related to his review, Wachtel stated his belief that even though visual fixations on roadway signs decrease as route familiarity increases, a strength of the new digital billboards is that they can present messages *that are always new*. Thus, the conclusion from the 1980 FHWA study is another argument against these billboards; namely, drivers spend more time looking at the unfamiliar signs than at familiar ones, suggesting digital billboards are more dangerous than traditional fixed billboards. Wachtel also suggested his preference for a goal to have any given driver experience only one, or a maximum of two, messages from an individual roadside sign.

3.2 Billboards: a Source of Driver Distraction? [1]

The purpose of a sign is to attract the attention of passersby so that a message is conveyed. To the degree signs attract the attention of vehicle drivers, they may distract them from the activity of driving. While this report primarily examines the impact of *dynamic* roadside advertising, the role traditional *static* advertising plays in driver distraction is discussed below.

The relationship between roadside advertising and crash rates has been the subject of several studies. The majority of this research was conducted in the 1950s, 60s and 70s. While some of the earliest studies have been subsequently criticized for flawed methodologies and improper statistical techniques, some findings emerge when the totality of the studies are examined. One of these findings is that the correlation between crash rates and roadside advertising is strongest in complex driving environments. For example, higher crash rates were found at intersections (generally considered a complex environment) that have advertising than those intersections that do not have advertising. A few of the studies that are important in this field are summarized below.

Minnesota Department of Transportation Field Study (1951) and Michigan State Highway Department Field Study (1952) [2]

These two studies from the early 1950s used similar methods but came to significantly different conclusions. Recognized as the more scientifically rigorous study, the Minnesota study found that increases in the number of advertising signs per mile are correlated with increases in motor vehicle crash rates. It also found that intersections with at least four advertising signs experienced three times more crashes than intersections with no advertising signs. Conversely, the less rigorous Michigan study found the presence of advertising signs had no effect on the number of crashes.

Iowa State College, Do Road Signs Affect Accidents? (Lauer & McMonagle, 1955)[3]

A laboratory test was created to determine the effect of advertising signs on driver behavior. The results of this study found removing all advertising signs from the driver's field of vision did not improve driver performance. When signs were included, driver performance was slightly better. Note that laboratory methods used in this study are considered to be dated by today's standards.

Faustman (California Route 40) Field Study (1961)[4] and Federal Highway Administration, Reanalysis of Faustman Field Study (1973)[5]

Two studies that appear to have stood the test of time are Faustman's original analysis of California Route 40 and its re-examination by FHWA more than a decade later. The original analysis tried to improve upon previous research by limiting variables, such as roadway geometric design and roadway access controls. The FHWA reanalysis focused on disaggregating the data and converting actual crashes to expected crash rates on specific roadway sections. Each of the sections was given a value based on the number of billboards on the section. A linear regression was performed to determine the expected crash rates. An analysis of variance of the regression coefficients found that the number of billboards on a section was statistically significant. The reanalysis found a strong correlation between the number of billboards and crash rates as shown in Table 1.

Table 1. FHWA Reanalysis of Faustman's Findings.

No. of Billboards	Expected No. of Accidents in a 5-year Period	Cumulative Increase in Accident Rate
0	5.92	
1	6.65	12.3
2	7.38	24.2
3	8.11	37.0
4	8.84	49.3
5	9.57	61.7

Federal Highway Administration
***Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage* (Wachtel & Netherton, 1980)[6]**

This extensive review provides a comprehensive discussion of roadside advertising research as of 1980. The study authors noted "attempts to quantify the impact of roadside advertising on traffic safety have not yielded conclusive results." The authors found that courts typically rule on the side of disallowing billboards because of the "readily understood logic that a driver cannot be expected to give full attention to his driving tasks when he is reading a billboard." Because the distraction evidence is not conclusive, these decisions were generally not based on empirical evidence.

The research review noted that accident reports often cite "driver distraction" as a default category used by uncertain law enforcement officers who must identify the cause of a crash. As a result, the authors believe crashes due to driver distraction are not always properly identified. In addition, law enforcement officers often fail to indicate the precise crash locations on crash reports, making it difficult to establish relationships between crashes and roadside features.

Accident Research Unit, School of Psychology, University of Nottingham
***Attraction and distraction of attention with roadside advertisements* (Crundall et al., 2005)** [7]

This research used eye movement tracking to measure the difference between street-level advertisements and raised advertisements in terms of how they held drivers' attention at times when attention should have been devoted to driving tasks. The study found that street-level advertising signs are more distracting than raised signs.

3.3 "Dynamic" Billboards: an Additional Source of Distraction?

Signage owners or leasers want to incorporate dynamic features into their signage for a number of reasons: to enhance the sign's ability to attract attention, to facilitate display of larger amounts of information within the same sign area, to conveniently change message content, and to enhance profitability. As mentioned earlier, this report uses the term "dynamic" signs to refer to non-static signs capable of displaying multiple messages. Several studies documented the ability of a sign to accomplish the first of these goals.

University of Toronto
***Observed Driver Glance Behavior at Roadside Advertising Signs* (Beijer & Smiley, 2004)** [8]

Research done at the University of Toronto compared driver behavior subject to passive (static) and active (dynamic) signs. The study found that about twice as many glances were made toward the active signs than passive signs. A disproportionately larger number of long glances (greater than 0.75 seconds) taken were toward the active signs. The duration of 0.75 seconds is important because it is close to the minimum perception-reaction time required for a driver to react to a slowing vehicle. For vehicles with close following distances, or under unusually complex driving conditions, a perception delay of this length could increase the chance of a crash. The following findings were reported in this study:

- 88% of the subjects made long glances (greater than 0.75 seconds).
- 22% of all glances made at all signs were long glances (greater than 0.75 seconds).
- 20% of all the subjects made long glances of over two seconds.
- As compared to static and scrolling text signs, video and tri-vision signs attracted more long glances.
- Video and scrolling text signs received the longest average maximum glance duration.
- All three of the moving sign types (video, scrolling text and tri-vision) attracted more than twice as many glances as static signs.

University of Toronto
***Impact of Video Advertising on Driver Fixation Patterns* (Smiley et al., 2001)** [9]

Another study completed at the University of Toronto used similar eye fixation information in urban locations to show that drivers made roughly the same number of glances at traffic signals and street signs with and without full-motion video billboards present. This may be interpreted to mean that while electronic billboards may be distracting, they do not appear to distract drivers from noticing traffic signs. This study also found that video signs entering the driver's line of sight directly in front of the vehicle (e.g., when the sign is situated at a curve) are very distracting.

City of Seattle Report (Wachtel, 2001) [10]

The City of Seattle commissioned a report in 2001 to examine the relationship between electronic signs with moving/flashing images and driver distraction. The report found that electronic signs with moving images contribute to driver distraction for longer intervals than electronic signs with no movement. Following are major points made in the report:

- New video display technologies produce images of higher quality than previously available technologies. These signs have improved color, image quality and brightness.
- New video display technologies use LEDs with higher viewing angles. Drivers can read the sign from very close distances when they are at a large angle from the face of the sign.
- Signs with a visual story or message that carries for two or more frames are particularly distracting because drivers tend to focus on the message until it is completed rather than the driving task at hand.
- Research has shown that drivers expend about 80 percent of their attention on driving related tasks, leaving 20% of their attention for non-essential tasks.
- The Seattle consultant suggests a "10 second rule" as the maximum display time for a video message.

The expanded content of a dynamic sign also contributes to extended distraction from the driving task. The Seattle Report examined how this may be due in part to the *Zeigarnik effect* which describes the psychological need to follow a task to its conclusion. People's attention is limited by the ability to only focus on a small number of tasks at a time, and by the tendency to choose to complete one task before beginning another. In a driving environment, drivers' attention might be drawn to the sign rather than the task of driving because they are waiting to see a change in the message. This loss of attention could lead to unsafe driving behaviors, such as prolonged glances away from the roadway, slowing, or even lane departure.

While the Zeigarnik effect may be present in a wide variety of driving situations, possible scenarios that could affect drivers include:

- A scrolling message requires the viewer to concentrate as the message is revealed. Based on the size and resolution of the sign, and the length of the message, this could range from less than one second to many seconds.
- A sequence of images or messages that tell a story, during which the driver's attention may be captured for the entire duration that the sign is visible. Instead of merely glancing at the sign and then returning concentration to the driving task, more attention may be given to the message.
- Anticipation of a new image appearing, even if the expected new image is not related to the first image. In this case, the driver may be distracted while waiting for the change.

Federal Highway Administration
***Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage* (Wachtel & Netherton, 1980)** [11]

This research provides information on the use of on-premise Commercial Electronic Variable-Message Signs (CEVMS) that display public service information (i.e,. time and temperature) and advertising messages along the Interstate highway system. The research found the following major considerations:

- Highway Safety Considerations

  The link between changing messages that attract drivers' attention and crashes has been an issue of concern since the earliest forms of electronic signage became available. This study thoroughly reviewed the literature seeking information regarding a potential link between CEVMS and crashes:

  > *"Although a trend in recent findings has begun to point to a demonstrable relationship between CEVMS and accidents, the available evidence remains statistically insufficient to scientifically support this relationship."*

  The study also noted that studies have not documented information about "such occurrences as 'near misses' or traffic impedances that are widely recognized as relevant to safety, and which may or may not be attributable to the presence of roadside advertising."

- Human Factors Considerations

  Human factors relate to all the elements that explain driver behavior, such as eye glances and driver responses to a variety of driving-related stimuli. The study makes the point that simple driving-related tasks consume relatively little information processing capacity. However, when other conditions, such as congestion, complicated roadway geometries, or weather are also considered, the marginal extra

amount of attention required to read roadside advertisements could lead to driving errors that could cause crashes.

> *"The enormous flexibility of display possessed by CEVMS makes it possible to use them in ways that can attract drivers' attention at greater distances, hold their attention longer, and deliver a wider variety of information and image stimuli than is possible by the use of conventional advertising signs."*

Texas Transportation Institute for FHWA, Impacts of Using Dynamic Features to Display Messages on Changeable Message Signs (Dudek et al., 2005) [12]

This study examined the comprehension times for three different scenarios for DOT-operated changeable message signs. The scenarios evaluated were:

- Flashing an entire one-phase message
- Flashing one line of a one-phase message while two other lines of the message remain constant
- Alternating text on one line of a three-line CMS while keeping the other two lines of text constant on the second phase of the message

The findings of this study were:

- Flashing messages did not produce faster reading times.
- Flashing messages may have an adverse effect on message comprehension for unfamiliar drivers.
- Average reading times for flashing line messages and two-phase messages were significantly longer than for alternating messages.
- Message comprehension was negatively affected by flashing line messages.

While this research did not evaluate advertising-related signs, it does demonstrate that flashing signs require more of the driver's time and attention to comprehend the message. In the case of electronic billboards, this suggests that billboards that flash may require more time and attention to read than static ones.

3.3.1 OTHER INFORMATION

NHTSA Driver Distraction Internet Forum (2000) [13]

The National Highway Traffic Safety Administration held an internet forum to gather research and public comment related to driver distraction with an emphasis on the use of cell phones, navigation systems, wireless Internet and other in-vehicle devices. During this forum, participants were invited to take a poll to determine the most prominent driver

distraction issues. Electronic billboards were identified as one of six noted sources of distraction.

Parliament of Victoria, Australia, Report of the Road Safety Committee on the Inquiry into Driver Distraction (2006) [14]

This report identified road signs and advertising as one of the largest sources of driver distraction. At least three billboards near Melbourne, Australia display moving images.

> *"The Committee considers these screens to be at the high end of potential visual distraction and accordingly, present a risk to drivers."*

The study also included a quote from the Manager of the Road User Behaviour group at VicRoads (the State's road and traffic authority) from a December 2005 hearing:

> *What we do know is when there is movement involved, such as flicker or movement in the visual periphery, that this is more likely to capture a driver's attention. We actually are hard-wired as human beings to movement, so particularly moving screens and information that scrolls at intersections and in highly complex driving situations – these are risky, and in particular researchers have been most concerned about those sort of advertising materials.*

This opinion would suggest that electronic signs can present a distraction to drivers.

3.4 How Much Distraction Is a Problem?

A number of studies were identified that discussed concerns with driver distraction generally. It should be noted that some of the studies cited use specific crash data that is ten or more years old. Direct comparison of distraction sources to influences of today may not be completely valid due to increased technological sophistication of distracting influences. These could include in-vehicle technology (e.g., navigation systems, MP3 players, DVD players, CD players, computer systems, etc.) as well as other potentially distracting influences (e.g., cell phones, text messaging, dynamic signage, other roadway elements, etc.) that were not commonplace when the data for these studies was collected:

Australian Road Research Board
***Investigations of Distraction by Irrelevant Information* (Johnston & Cole, 1976)** [15]

This research used five experiments to test whether drivers could maintain efficient performance in their driving tasks while being subjected to content that was information rich, but irrelevant to driving. The findings were that a small, but statistically significant amount of performance degradation was observed when the participant was under a critical load of stimuli.

National Highway Traffic Safety Administration/ Virginia Tech Transportation Institute
***Impact of Driver Inattention on Near-Crash/Crash Risk: An Analysis Using the 100-Car Naturalistic Driving Study Data* (Klauer et al., 2006)** [16]

This study analyzed the data from a driving database developed by the National Highway Traffic Safety Administration. This database contained exhaustive data recorded by instrumented vehicles that measured glance position, impairment, drowsiness, risk taking and many other parameters potentially involved in crash causation. Vehicles were instrumented so that an observer did not need to be in the vehicle to collect data. Automated data collection reduced the problem of an observer influencing driver behavior. The study found that glances of two seconds or greater doubled the risk of crashes or near-crashes. The study also found that 22 percent of crashes are accompanied by "secondary-task" distraction whether inside or outside the vehicle.

National Highway Traffic Safety Administration/ Virginia Tech Transportation Institute
***Driver Inattention is a Major Factor in Serious Traffic Crashes* (2001)** [17]

The National Highway Traffic Safety Administration commissioned a study to examine the causes of crashes. The study gathered information from four areas throughout the country and used data from the National Automotive Sampling System (NASS) from April 1996-April 1997 for analysis. The geographic areas were selected because they had good crash investigation practices and high interview completion rates. The results of this study are summarized in Table 2.

Table 2. Crash Causation Summary

Causal Category	Percentage of Drivers Contributing to Causation
Driver Inattention	22.7
Vehicle Speed	18.7
Alcohol Impairment	18.2
Perceptual Errors	15.1
Decision Errors	10.1
Incapacitation	6.4
Other	8.8

Association for the Advancement of Automotive Medicine
***The Role of Driver Inattention in Crashes; New Statistics from the 1995 Crashworthiness Data System* (Wang, 1996)** [18]

This report analyzed the NHTSA 1995 Crash Worthiness Data System (CDS). It found that the greatest source of driver distraction (3.2 percent) was due to a specified person, object or event outside the vehicle. The full results of the study are presented in Table 3.

Table 3. Percentage of CDS Crashes Involving Inattention-Distraction Related Crash Causes

Data Element	% of Drivers	% of Crashes
Attentive or not distracted	46.6%	28.4%
Looked but did not see	5.6%	9.7%
Distracted by other occupant [specified]	0.9%	1.6%
Distracted by moving object in vehicle [specified]	0.3%	0.5%
Distracted while dialing, talking, or listening to cellular phone [location and type of phone specified]	0.1%@	0.1%@
Distracted while adjusting climate controls	0.2%@	0.3%@
Distracted while adjusting radio, cassette, CD [specified]	1.2%	2.1%
Distracted while using other device/object in vehicle [specified]	0.1%	0.2%
Sleepy or fell asleep	1.5%	2.6%
Distracted by outside person, object, or event [specified]	2.0%	3.2%
Eating or drinking	0.1%	0.2%
Smoking-related	0.1%	0.2%
Distracted/inattentive, details unknown	1.5%	2.6%
Other distraction [specified]	1.3%	2.2%
Unknown/No Driver	38.5%	46.0%

Weighted driver N = 4,627,000 (7,943, unweighted); weighted crash N = 2,619,000 (4,536);
In order for a *crash* to classified "attentive," all involved drivers had to be classified "attentive."
@ - estimate based on 5-9 cases.

University of North Carolina Highway Safety Research Center
The Role of Driver Distraction in Traffic Crashes (Stutts et al., 2001) [19]

A study prepared by the University of North Carolina Highway Safety Research Center for the AAA Foundation for Traffic Safety examined the sources of driver distraction in traffic crashes. The data came from the CDS from 1995-1999. Of the thirteen specific sources of distraction tracked by the study, the greatest source of distraction was an outside person, object or event. While the study does not break down the sources of outside distraction, it does show that distractions outside the vehicle are the largest factor in distraction-related crashes. The results of this study are presented in Table 4.

Table 4. Specific Sources of Distraction Among Drivers in Distraction–Related Crashes

Specific Distraction	Percentage of Drivers
Outside person, object or event	29.4
Adjusting radio, cassette, CD	11.4
Other occupant in vehicle	10.9
Moving object in vehicle	4.3
Other device/object brought into vehicle	2.9
Adjusting vehicle/climate controls	2.8
Eating or drinking	1.7
Using/dialing cell phone	1.5
Smoking related	0.9
Other distraction	25.6
Unknown distraction	8.6
Total	100.0

Three studies were found which attempted to measure driver behavior specifically in response to dynamic signage. Two of these studies demonstrated a potential relationship between dynamic signage and crash rates:

Minnesota Department of Transportation, The Effectiveness and Safety of Traffic and Non-Traffic Related Messages Presented on Changeable Message Signs (CMS) (Harder, 2004) [20]

This study used a driving simulator to measure the effect of Department of Transportation changeable message signs on traffic flow. The two messages evaluated were a "crash ahead" warning and an AMBER Alert (child abduction information). The research found that just over half of the participants used the "crash ahead" message and 60 percent could recall the AMBER Alert with scores of Good or Better. Over one fifth of the participants slowed down by at least 2 mph upon seeing the AMBER Alert, demonstrating that messages relevant to drivers are associated with changes in at least some drivers' travel speed .

***Decision of the Outdoor Advertising Board in the Matter of John Donnelly & Sons, Permitee, Telespot of New England, Inc., Intervenor, and Department of Public Works, Intervenor, with Respect to Permit Numbered 19260 as Amended* (1976)** [21]

This proceeding documents the Commonwealth of Massachusetts Outdoor Advertising Board's ruling regarding one of the first changeable signs. This sign was located near an arterial road in Boston and used magnetic discs to portray a message that changed every 30 seconds. The original sign permit was rejected based on four criteria, one of which was safety. Upon appeal, the Massachusetts Department of Public Works allowed the permit based on the fact that the sign would give the public a benefit. However, they ultimately determined that the sign was a safety hazard based on crash rates before and after the sign was installed. Tables 5 and 6 show the change in crash rates.

Table 5. Telespot Sign Crash Rates - Expressway Southbound

	Average per year (1/1/1970-12/31/1972)	Average per year (1/1/1973-3/31/1975)	Average Percent Change
Crashes where the sign was viewable (north of sign)	29.0	20.0	-31.0
Crashes where the sign was not viewable (south of sign)	39.0	15.6	-60.0

Table 6. Telespot Sign Crash Rates - Expressway Northbound

	Average per year (1/1/1970-12/31/1972)	Average per year (1/1/1973-3/31/1975)	Average Percent Change
Crashes where the sign was viewable (south of sign)	46.3	42.7	-7.8
Crashes where the sign was not viewable (north of sign)	8.0	1.8	-77.5

This analysis shows that while crash rates decreased on comparable sections in the years after the sign was installed, the sections where the sign was visible experienced smaller crash rate decreases. Due to these arguments, the Board ruled that the operation of the sign must be terminated.

Wisconsin Department of Transportation
Milwaukee County Stadium Variable Message Sign Study – Impacts of an Advertising Variable Message Sign on Freeway Traffic (1994) [22]

A study prepared by the Wisconsin Department of Transportation (WisDOT) examined crash rates before and after an advertising variable message sign was installed in 1984 on the Milwaukee County Stadium, home of the Milwaukee Brewers professional baseball team. Crash statistics were analyzed for the three years before and the one and three years after the sign was installed. As they are often associated with driver distraction, side-swipe and rear-end crashes, as well as total crashes, were examined for both the eastbound and westbound directions. The sign was much more visible to eastbound traffic due to the stadium's proximity to the roadway and the amount of visual obstructions for westbound traffic.

The analysis found an increase in crash rates for all crash types in the eastbound direction after the sign was installed. Most pronounced was an 80 percent increase in side-swipe crashes after the first year of installation. Results in the westbound direction were mixed, with a 29 percent decrease in crashes the first year the sign was in place and a 35 percent increase in the three years the sign was in place. Although no control roadway sections were studied, an interview with the study author revealed that the introduction of a sign on a high volume curving roadway may have introduced enough distraction to an already demanding driving environment to explain the higher crash rate in the eastbound direction. The study author also stated that the study was not able to establish a causal relationship between the sign and the crash rates.[23]

Federal Highway Administration
Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction (2001) [24]

The Federal Highway Administration published a comprehensive report in 2001 that consisted of a literature search, literature review and a description of research needs for

the topic of electronic billboards (EBBs). While the study did not conduct any new research, it does provide an excellent summary of the role electronic billboards play in traffic safety and includes good descriptions of the terminology related to electronic billboards. Selected findings from that synthesis are provided below:

> *"In most instances, researchers were not able to verify that an EBB was a major factor in causing a crash. Only one study since the 1980 review and one lawsuit were identified."*
>
> *"Studies were identified that verified that: an increase in distraction, a decrease in conspicuity, or a decrease in legibility may cause an increase in the crash rate."*
>
> *"Commercial EBBs are designed to 'catch the eye' of drivers. Their presence may distract drivers from concentrating on the driving task and visual surrounds."*
>
> *"There is indication that individual differences in age and driving experience may be important considerations in driver distraction, and are relevant to understanding driver responses to the external environment. Furthermore, research regarding driver familiarity of their route demonstrated that visual fixations on roadway signs decreases as route familiarity increases. This research may show that there is a difference between commuter and visiting drivers."*

Based on these findings, the FHWA recommended additional research to further demonstrate how roadway characteristics, sign characteristics and legibility, driver characteristics and other potential driver distractions affect traffic safety. FHWA was contacted to see if any new information was available. Greg Davis, a Research Psychologist with the FHWA Office of Safety R&D, indicated that the FHWA has not performed additional studies on the topic since the report was published. He stated that there is "no direct correlation between electronic outdoor advertising signs and crash rates". He referred to a before/after study of electronic signs installed along a freeway in Las Vegas that found no change in crash rates. He went on to say that the lack of a research finding that links signs with crash rates does not mean that a causal relationship does not exist. He indicated that he has been contacted by several law enforcement agencies regarding the link between driver distraction and dynamic message signs/electronic billboards. He indicated that this is a timely and pertinent topic for many states due to the increasing popularity and capabilities of electronic outdoor advertising devices, and he expects further research to be forthcoming. He advocates for a new study that can control for all variables and determine if a cause and effect relationship exists.[25]

3.5 How Does "Brightness" Affect Driver Safety Concerns?

The brightness of any sign, static or dynamic, raises concerns with discomfort or disability glare to the driver that may arise when viewing any lighted object. *Disability Glare* occurs when a

driver is exposed to a light source so bright that it temporarily blinds the driver, impairing their ability to perform driving tasks. This temporary blindness is brief, but can be dangerous. *Discomfort Glare* occurs when a light source is bright enough to distract or encourage the driver to look away from the light, but is not blinding. Discomfort glare is of particular concern in cases where a bright sign is located in the same line of sight as a traffic sign, signal or another vehicle.

While concerns about glare are not unique to dynamic signs, newer sign technologies, which often include dynamic components, have the technical capability to emit more light and/or respond to ambient light conditions, raising additional concerns about sign brightness in areas where signs compete with regulatory traffic signs or signals.

3.6 Billboards and Other Signage Regulation: a Minnesota Perspective

Roadside signage is governed by policies and laws at the federal, state and local levels. Minnesota Statute, Chapter 173 seeks to "reasonably and effectively regulate and control the erection or maintenance of advertising devices on land adjacent to such highways." The statute requires adherence to federal statutes with respect to interstate and primary systems of highways.

Minnesota Statute Ch. 173.16 Subd. 3. regulates lighting of signs. Signs which are "illuminated by any flashing light or lights, except those giving public service information" (time, date, temperature, weather or news) are prohibited. This section also states:

> (b) Advertising devices shall not be erected or maintained which are not effectively shielded so as to prevent beams or rays of light from being directed at any portion of the traveled way of an interstate or primary highway, of such intensity or brilliance as to cause glare or impair the vision of the operator of any motor vehicle; or which otherwise interfere with any driver's operation of a motor vehicle are prohibited.
>
> and
>
> (c) Outdoor advertising devices shall not be erected or maintained which shall be so illuminated that they interfere with the effectiveness of or obscure any official traffic sign, device or signal.

3.7 Billboard and Other Signage Regulation: Other Perspectives

During the course of this study, several articles were found which summarize regulation of dynamic signage in other states:

Wisconsin Department of Transportation
***Electronic Billboards and Highway Safety* (2003)** [26]

The Wisconsin Department of Transportation also published a literature review report to further explain the current state of EBB research. Although much of the information is

mentioned in other sections of this report, the Wisconsin review did summarize Wisconsin's regulations for electronic billboards.

- No message may be displayed for less than one-half second;
- No message may be repeated at intervals of less than two seconds;
- No segmented message may last longer than 10 seconds;
- No traveling message may travel at a rate slower than 16 light columns per second or faster than 32 columns per second (light column defined as pixel column);
- No variable message sign lamp may be illuminated to a degree of brightness that is greater than necessary for adequate visibility.

National Alliance of Highway Beautification Agencies (1999) [27]

Although this survey is eight years old, it generated the following information related to electronic billboards:

- Nine states had specific regulations governing signs,
- Nine states had regulations on tri-vision signs that were either being drafted or in pending legislation,
- Fifteen states had regulations regarding moving parts and/or lights,
- Nine state had no regulations on tri-vision signs, and
- Six states and Washington, DC, prohibited tri-vision signs.

An investigation into state outdoor advertising regulations was also conducted.

- Thirty-six states had prohibitions on signs with red, flashing, intermittent, or moving lights,
- Twenty-nine states prohibited signs that were so illuminated as to obscure or interfere with traffic control devices, and
- Twenty-nine states prohibited signs located on interstate or primary highway outside of the zoning authority of incorporated cities within 500 ft of an interchange or intersection at grade or safety roadside area.

Parliament of Victoria, Australia, Report of the Road Safety Committee on the Inquiry into Driver Distraction (2006) [28]

This report, cited earlier for its driver distraction opinions, identifies road signs and advertising as one of the largest sources of driver distraction. VicRoads, the state's road and traffic authority, has implemented the following regulations.

Figure 1. VicRoads' Ten Point Road Safety Checklist

An advertisement, or any structure, device or hoarding for the exhibition of an advertisement, is considered to be a road safety hazard if it:

1. obstructs a driver's line of sight at an intersection, curve or point of egress from an adjacent property; or
2. obstructs a driver's view of a traffic control device, or is likely to create a confusing or dominating background which might reduce the clarity or effectiveness of a traffic control device; or
3. could dazzle or distract drivers due to its size, design or colouring, or it being illuminated, reflective, animated or flashing; or
4. is at a location where particular concentration is required (eg. high pedestrian volume intersection); or
5. is likely to be mistaken for a traffic control device, for example, because it contains red, green or yellow lighting, or has red circles, octagons, crosses or triangles, or arrows; or
6. requires close study from a moving or stationary vehicle in a location where the vehicle would be unprotected from passing traffic; or
7. invites drivers to turn where there is fast moving traffic or the sign is so close to the turning point that there is no time to signal and turn safely; or
8. is within 100 metres of a rural railway crossing; or
9. has insufficient clearance from vehicles on the carriageway; or
10. could mislead drivers or be mistaken as an instruction to drivers.

VicRoads also gives operational requirements for electronic advertising message signs. Signage must:

- not display animated or moving images, or flashing or intermittent lights;
- remain unchanged for a minimum of 30 seconds;
- not be visible from a freeway; and
- satisfy the ten-point checklist.

4.0 SUGGESTED REGULATORY APPROACH

Local governments regulate electronic outdoor advertising devices in widely varying degrees. Some cities completely prohibit the use of all electronic signs (sometimes specifying LED signs), while others have no regulations specific to electronic signs. Between those two extremes, there are many levels and types of control that can be applied.

The primary concerns to keep in mind when considering sign regulations are 1) First Amendment rights, which can be affected by regulations that affect the content of a sign's message, and therefore should be avoided, and 2) changing technology, which can quickly make a sign ordinance no longer applicable if the ordinance has been specifically written to address a certain type of sign technology. Performance based measures may therefore be preferable as they remain viable even as sign technology advances.

4.1 Definitions

Signage discussions often include a number of different words or phrases used to describe the technical characteristics of signage devices or their components (such as LEDs). For the purpose of zoning, some additional terms are also used to describe sign characteristics. Any regulatory efforts should take care to precisely define terminology. One possible resource in this effort is "Street Graphics and the Law," published by the American Planning Association (APA) Planning Advisory Service[29].

4.2 Types of Regulatory Measures

4.2.1 Complete or Partial Prohibition of Electronic Signs

Some cities have completely prohibited the use of electronic outdoor advertising devices. For example, the City of Maple Valley, WA prohibits all types of electronic outdoor advertising devices including animated signs, electronic changeable message signs, flashing signs or displays, moving signs, scrolling displays, and traveling displays. This applies to both on-premise and off-premise signs.

Other cities are very selective about where electronic signs are allowed, allowing them only in certain zoning districts. There are very few "standard" approaches. For the most part, each local

government tailors their regulations to their own situation. One approach adopted by cities is to prohibit electronic outdoor advertising devices in residential zoning districts, and for a certain distance away from residential zoning districts, similar to the zoning limitations placed on illuminated signs. Some ordinances require that electronic signs be situated such that the sign face is not visible from nearby residences.

4.2.2 Size Limitations on Electronic Signs

Another way of regulating electronic signs is to limit their size. Again, there is no set standard for this. One ordinance reviewed for the purpose of this study limits the electronic portion of a sign to no more than 50 percent of the sign face with the overall size determined by whatever the sign ordinance allows for a particular zoning district. Other examples of electronic sign size limitations include five square feet, 1,000 square inches, 20 square feet, and so forth. In other ordinances, there is no differentiation made between the size of electronic signs and other signs.

According to input from representatives of the sign industry, the smaller the size of the electronic sign, the more desirable it is for businesses to use frequent message changes, or sequenced messages, where more than one screen of text is used to convey an entire message.

4.2.3 Rate-of-Change Limitations on Electronic Signs

Many communities that allow electronic signs also regulate the rate at which the messages on the signs can be changed. Research on sign codes has shown this to range from as little as four seconds to as long as 24 hours.

The Interstate 394 sign between Ridgedale Drive and Plymouth Road is visible for approximately 45 seconds at free flow traffic speeds. Depending on text size, the message may not be readable by drivers during this entire duration, but the message changes can attract attention from long distances. Depending on how often the message changes occur and the speed of traffic, drivers on this segment could see a varying number of discrete messages. Table 7 provides the number of message changes a driver would see at different change durations and traffic speeds.

Table 7. Number of New Messages Seen at Various Driver Speeds and Time Intervals Between Messages

		Number of Messages Seen					
		Message Display Time (seconds)					
Speed (mph)	**Time sign is clearly visible* (seconds)**	**6**	**8**	**10**	**60**	**1800 (30 minutes)**	**3600 (1 hour)**
30	60	11	9	7	2	1	1
45	40	8	6	5	2	1	1
55	33	7	5	4	2	1	1

*Assuming the sign is clearly visible from one-half mile away.

Prohibiting displays from changing quickly can minimize potential driver distraction, but it would significantly limit the message owner's ability to convey information that does not fit on one screen of the sign. Using two or more successive screens to convey a message is referred to as sequencing. Based on the studies summarized in part 3 of this Report, including the glance duration studies performed by Klaur for the FHWA in 2006 and by Beijer & Smiley in 2004, and Wachtel's analysis for Seattle of the Zeigarnik effect, a message delivery system such as sequencing that requires or induces a driver to watch the sign for several seconds increases the likelihood of driver distraction. Based on information from the sign industry, for sequencing to be effective in a marketing sense, a brief rate-of-change (1-2 seconds) is generally used before transitioning into the next screen.

Some codes specify how an image changes, while other codes prohibit the use of transitions. The change from one image to another can be accomplished by various techniques: no transition – simply a change from one screen to another, or fading or dissolving one image into the next. Flashing, spinning, revolving, or other more distracting transition methods can be prohibited, allowing businesses to use sequencing in an effective manner without making the signs overly distracting. Another way of regulating distracting transitions is to require a very short time of a dark or empty screen between images.

4.2.4 Motion, Animation, or Video Limitations on Electronic Signs

Motion on a sign can consist of everything from special text effects (spinning, revolving, shaking, flashing, etc.) to simple graphics, such as balloons or bubbles rising across the screen, to more realistic moving images that have the appearance of a television screen. According to sign industry representatives, video imagery on a sign is referred to as "animation" if the sign is limited to the capability of 10 frames per second. Fewer frames per second make the moving image look more like animation. Imagery produced by signs that have the capability of processing up to 30 frames per second is accurately referred to as "video" imaging.

Many communities that allow dynamic signs do not allow the application of any type of motion, animation, or video on the signs. However, Seattle was obliged to allow video imagery on their signs after earlier signage code regulating certain types of signs was not strictly enforced. In addition to requiring a dark period between successive messages to overcome the Zeigarnik effect, Seattle also limits the duration of the video message to a minimum of two seconds and a

maximum of 10 seconds. This time frame was established based upon careful calculations of the streets from which these signs could be seen, speed limits and traffic volumes in addition to the community's concern over the extent to which moving images could distract drivers. However, Seattle also limits the size of their electronic signs to a maximum of 1,000 square inches, with no single dimension greater than three feet, thus minimizing the effect of video images.

4.2.5 Sign Placement and Spacing

Regulating the number of dynamic sign potentially visible to a driver at any one time as well as the position of the sign in relationship to the roadway may reduce distraction to drivers. Spacing requirements should consider the speed, width and horizontal and vertical alignment of the roadway.

Some communities have established minimum distances between electronic signs. Establishing an adequate distance between these types of devices seems particularly important if a fairly fast rate of change is allowed for the purpose of facilitating sequenced messages or if animation and video imaging is allowed. Closely spaced signs attempting to convey sequenced messages may simply create visual overload and an over-stimulated driving environment. Research conducted to date has not yielded information about optimal electronic sign spacing. Seattle adopted a 35-foot spacing requirement for their electronic signs based upon multiple levels of analysis of the downtown city environment in which these signs are present.

Due to the varying characteristics of individual roadways in this regard, overlay districts allowing dynamic signage with conditions specific to that area could be considered. Overlay districts could also take into account other locational factors such as offset from the roadway and conspicuity. Determining appropriate offsets from the roadway must consider roadway clear zone requirements as well as spacing of frontage roads and access points, while also considering the signage too far outside the driver's line of sight may be a further distraction. Conspicuity, a sign's ability to stand out from its surroundings, should also be considered.

4.2.6 Text Size

Legibility is another important property of signage. The preferred approach used within highway signing is that drivers can read text that is 1 inch high from 30 feet away. Larger text is needed for signs to be legible at greater distances. Large, legible text allows the driver to read the billboard from varying distances and focus on the driving task. Conversely, with small text, the driver is more likely to focus on the sign for a longer period of time and possibly be more adversely distracted. However, the size or type of text or the amount of text due is rarely regulated.

4.2.7 Brightness Limitations on Electronic Signs

One of the main concerns about the use of electronic signs, regardless of whether they consist of changeable text, animation, or video, is the brightness of the image. The brightness of an object can be characterized in two ways. *Iluminance* is the total brightness of all the light at a point of measurement. Illuminance often describes ambient light and can be measured with a standard light meter such as is used in photography. *Luminance* is the measure of the light emanating from an object with respect to its size and is the term is used to quantify electronic sign brightness. The unit of measurement for luminance is nits, which is the total amount of light emitted from a sign divided by the surface area of the sign (candelas per square meter).

Many, but not all, LED-type signage can be time-programmed to respond to day and nighttime light levels. Higher-end signage types are equipped with photo cells to respond to ambient light conditions. Despite these controls, LED signs have been observed that are considered to be excessively bright. Sign industry representatives indicate that excessive brightness can be the result of 1) sign malfunction or improper wiring, 2) lack of photo cell and/or dimming mechanism, or 3) operator error or lack of understanding that brightness is not necessarily an advantage, especially if it makes a sign unreadable or unpleasant to look at. They also maintain that the intent of the electronic sign industry is to establish a brightness level that is similar to a traditional internally or externally lit sign. Recent observations of sign technicians calibrating the Interstate 394 LED billboard noted that the brightness controls are not calibrated to specific nit levels, but rather vary in proportion to a set maximum level, like a volume control dial on a typical car radio.

To control the extent to which electronic signs are a distraction or the extent to which they are readable, many local governments have adopted regulations that limit nit levels. At this time, ordinances that use nit level limitations typically differentiate between day time and night time nit levels. A common daytime nit limitation ranges from 5,000 to 7,000 nits. A common nighttime limitation is 500 nits, although in areas that are extremely dark at night, with very little in the way of ambient light levels, less than 500 nits may be appropriate. Other communities have taken this farther, such as Lincoln, Nebraska, whose sign code incorporates a graph of varying ambient light levels ranging from night time to a bright sunny day and all conditions between those two extremes, and has correlating nit limitations for the various ambient light levels.

Enforcement of these types of regulations is challenging as luminance of electronic signs is very difficult to measure in the field. Typically, sign luminance is measured and calibrated in a controlled factory setting using a spectral photometer to measure the light output. This calibration setting is then used in conjunction with a photo cell to control the brightness of the sign. The higher the ambient light levels, the brighter the sign. There are different nit thresholds for various colors. White is most often used to set dimming levels because at a constant nit level, white has the most intensity as perceived by the human eye.

Lincoln uses a light meter to conduct testing on electronic signs and found a wide range of luminance levels. One small electronic sign had luminance levels of 13,000 nits. The process that Lincoln uses to check luminance levels is to hold a luminance meter close to the face of the sign so that it captures only the light emitted from the sign. They have not had any requests to

measure the brightness of LED billboards, so the viability of using this approach on billboards has not been explored.

In Seattle, sign luminance was found too difficult to measure, so signs are visually inspected when complaints from the public are received. Sign owners are then contacted and asked to adjust sign luminance accordingly.

Both Mesa, Arizona and Lincoln, Nebraska have included a requirement for written certification from the sign manufacturer that the light intensity has been preset not to exceed the illumination levels established by their code, and the preset intensity level is protected from end user manipulation by password protected software or other method approved by the appropriate city official. This language appears to offer the advantage of ensuring that electronic signs, at a minimum, cannot exceed a certain established level of brightness.

At a minimum, it is important for communities to require all electronic signs to be equipped with a dimmer control. A requirement for both a dimmer control and a photo cell, which constantly keeps track of ambient light conditions and adjusts sign brightness accordingly, is optimal.

Over time, the LEDs used in electronic signs have a tendency to lose some of their intensity, and an owner may choose to have the sign adjusted and calibrated, which involves adjusting the level of electrical current in a manner that affects the brightness of the sign. This occurs over the course of two or three years. Having maximum nit levels established would ensure that the sign company has upper limits to work with as far as adjusting the sign is concerned.

4.3 Public Review

Most communities establish rules within their sign code and do not create opportunities for electronic signs to be approved through conditional use permits or special use permits. Some communities with special overlay districts, or areas that are oriented toward entertainment and night life, have established a review process for electronic signs, or for various functions of electronic signs such as animation and video.

Other communities take the opposite approach, where they allow electronic signs with no controls whatsoever, except in certain special areas, such as a historic overlay district, or a historic downtown district, where the signs are prohibited. Each community needs to tailor their application of electronic signs to meet their needs.

As of the writing of this report, no ordinances have been discovered that have a special review committee just for the purpose of electronic signs. Typically, sign regulations established in the zoning ordinance would be reviewed in accordance with existing review and approval processes. As with other development features, dynamic signage should be either prohibited, permitted, or conditional depending upon the zoning district and/or the specific features of the sign as established within the city's regulations (i.e. size, specific location with respect to the adjacent roadway, zoning district, proximity of sensitive uses). The recommended review process for permitted dynamic signs should be the same as procedures already in place for administrative

review. For dynamic signs requiring a Conditional Use Permit (CUP), the standard process for public notification and a public hearing before the planning commission should apply.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Driver distraction plays a significant role in traffic safety. Driver distraction is a factor in one in four crashes, and of those crashes involving driver distraction, one in four involves distractions outside the vehicle. The extent to which dynamic signage contributes to traffic safety has been examined in this study. Following are some of the major findings from a review of available research.

- Drivers that are subjected to information-rich content that is irrelevant to the driving task (such as digital advertising) may be temporarily distracted enough to cause a degradation in their driving performance. This degradation could lead to a crash.
- The unlimited variety of changing content allows dynamic signage to attract drivers' attention at greater distances and hold their attention longer than traditional static billboards.
- Several studies have found a correlation between crashes and the complexity of the driving environment. For example, crash rates are higher at intersections because the difficulty of the driving task is increased by the roadway's complexity. Complex driving environments place a high demand on drivers' attention. Introducing a source of distraction in an already demanding driving environment is more likely to result in crashes. This is illustrated by the 1994 Wisconsin DOT study that examined crash rates before and after installation of an electronic sign on a high-volume curving roadway. Introduction of this sign was identified as a likely factor of the 80 percent increase in side-swipe crashes that was experienced.
- Many studies have noted a correlation between outdoor advertising signs and crash rates, but have not established a *causal* relationship between the signs and crash rates. Driving is a complex task influenced by multiple factors. It is not necessary to establish a direct causal relationship between outdoor advertising signs and crash rates to show that they can make the driving task less safe. While the research shows that driver distraction is a key factor in many motor vehicle crashes, this often includes many interacting factors that distract drivers. The specific driver distraction danger that advertising signs contribute is difficult to quantify. A study that could control for multiple variables (human factors, vehicle, enforcement and the roadway environment) would be needed to provide a definitive statement on the level of driver distraction that signs produce. Such a study would likely find that not all advertising signs cause distraction that would lead to crashes, but some signs in some situations are more likely to contribute to crashes than others.

Overall, the literature review conducted for the purpose of this study identifies a relationship between driver distraction and electronic outdoor advertising devices. As indicated, driver distraction is a significant factor in crashes. The purpose of dynamic signage is to attract the attention of people in vehicles, so a natural conclusion from that knowledge is that drivers may be distracted by them. Professional traffic engineering judgment concludes that driver distraction generally contributes to a reduction in safe driving characteristics.

For this reason, state departments of transportation have carefully studied the design and location of dynamic signs within the highway right-of-way. Their goal is to convey a message to the traveling public in a manner that is as straight-forward and readable as possible without being a visual "attraction". The goal of the outdoor advertising sign is to be a visual attraction outside the right-of-way, possibly making it a source of driver distraction. Nevertheless, the actual change in crash rates influenced by the presence of any specific device has not been quantified in a manner that fully isolates the impacts of an electronic sign. Recent studies conducted by FHWA and others have cited the need for further research.

In the interest of promoting public safety, this report recommends that electronic signs be viewed as a form of driver distraction and a public safety issue. Therefore, the ordinance recommendations identified here should be considered. These recommendations should be reviewed in the future as additional research becomes available.
With respect to regulatory measures for electronic outdoor advertising signs, it is important that local governments take a thorough approach to updating their ordinances to address this issue. For example, an ordinance that addresses sign motion, but does not address brightness and intensity levels may leave the door open for further controversy. This report seeks to identify all of the aspects of electronic outdoor advertising devices that are subject to regulation. It does not specifically state what those regulations should be (e.g. the size of electronic signs), since these are all things that policy makers and staff must take into careful consideration. Further, as driver distraction and resulting influences on safety do not, in a practical sense, distinguish between on-premise and off-premise signage, this distinction is not highlighted in the recommendations below.

Regulatory Measures recommended for consideration

To properly address the issue of dynamic signage, it is recommended that the sign code address the following:

1. Identify specific areas where dynamic signs are prohibited. This would typically be done by specifying certain zoning districts where they are not allowed under any circumstances. If dynamic signs are to be allowed in specific areas, this could be done by zoning district (only higher level commercial districts are recommended for consideration) or by zoning overlay related to specific purposes (e.g. entertainment or sports facility district) or to specific roadway types.

2. Determine the acceptable level of operational modes in conjunction with such zoning districts or overlays. The various levels include:

    a. Static display only, with no transitions between messages,

    b. Static display with fade or dissolve transitions, or transitions that do not have the effect of moving text or images,

    c. Static display with scrolling, traveling, spinning, zooming in, or similar special effects that have the appearance of movement, animation, or changing in size, or get revealed sequentially rather than all at once (e.g. letters dropping into place, etc.), and

d. Full animation and video.

3. If one of the forms of static display is identified as the preferred operational mode, a minimum display time should be established. This display time should correspond to the operation roadway speed (rather than posted speed limit), allowing at most one image transition during the time that the sign if visible to a driver traveling at the operational speed.

   If a shorter minimum display time is considered, the effects of message sequencing should be considered. Wait intervals of more than 1-2 seconds between sequenced messages have the potential to become more of a distraction as viewers wait impatiently for the next screen, in an effort to view the complete message.

4. If the community wishes to accommodate animation or video in some or all locations where dynamic are permitted, a minimum and maximum duration of a video image should be established. The purpose for establishing a time limit is to ensure that the message is conveyed in a short, concise time frame that does not cause slowing of traffic to allow drivers to see the entire message. Given the creativity of advertising, these video images may be seen as a form of entertainment, and people typically like to see an entertaining message through to the end.

   Differentiate between zoning districts where dynamic signs are permitted by right, and zoning districts, overlay districts, or special districts where they should only be allowed through the approval of a Conditional Use Permit. A CUP would involve public notification and review and approval by the Planning Commission. Other options would include a design review board or other dispute resolution process.

5. Consider the establishment of minimum distance requirements between electronic outdoor advertising devices in relation to the zoning district or roadway context in which the signs are allowed.

6. Consider size limitations on dynamic signs for zoning districts where they are allowed. This may vary from one district to another.

7. Consider if dynamic signs are allowed independently, or if they must be incorporated into the body of another sign, and therefore become a limited percentage of the overall sign face.

8. Establish a requirement for that all dynamic signs that emit light be equipped with mechanisms that allow brightness to be set at specific nit levels and respond accurately to changing light conditions. The City must establish the authority to disable or turn the device off if it malfunctions in a manner that creates excessive glare or intensity that causes visual interference or blind spots, and require that the device remain inoperable until such time that the owner demonstrates to the appropriate city official that the device is in satisfactory working condition. If such technology is not available, consideration should be give to banning dynamic signs that emit light until such time as the technology allows brightness levels to be precisely controlled.

9. Consider maximum brightness levels that correlate to ambient (day or night condition, lighting of surrounding context) light levels. A maximum daytime and separate nighttime nit/footcandle level should be established. Consider wording that requires the sign to automatically adjust its nit level based on ambient light conditions.

10. Consider a requirement for a written certification from the sign manufacturer that the individual sign's maximum light intensity has been preset not to exceed the maximum daytime illumination levels established by the code, and that the maximum intensity level is protected from end user manipulation by password protected software or other method approved by the appropriate city official.

11. Require sign owners to provide an accurate field method of ensuring that maximum light levels are not exceeded. If such a method cannot technically be provided, consider banning dynamic signs that emit light until such time as the technology is available.

PRELIMINARY DRAFT FOR REVIEW BY CITY OF MINNETONKA
Further changes are anticipated following Signage Workshop

*****Preliminary Report is specific to City of Minnetonka issues and may not be sufficient to address concerns in other communities*****

APPENDICES

PRELIMINARY DRAFT FOR REVIEW BY CITY OF MINNETONKA
Further changes are anticipated following Signage Workshop

*****Preliminary Report is specific to City of Minnetonka issues and may not be sufficient to address concerns in other communities*****

Appendix A

Current Sign Technologies

PRELIMINARY DRAFT FOR REVIEW BY CITY OF MINNETONKA
Further changes are anticipated following Signage Workshop

*****Preliminary Report is specific to City of Minnetonka issues and may not be sufficient to address concerns in other communities*****

Appendix A – Current Sign Technologies

Roadside signage has long been used to alert and direct travelers to retail businesses, lodging, attractions and other destinations. Until the 20th century much of this image was "static" in nature, presenting a single image that could only be altered by repainting or otherwise removing an image and replacing it with another. With the advent of motorized travel, signage became more "dynamic" or active in its efforts to attract the traveler's attention as they moved at ever increasing speeds. Initially, motion was created by flashing bulbs or alternating sets of neon tubes.

Today's technologies allow for an increasingly sophisticated display of images that can be manipulated by a few strokes of a keyboard. Simpler forms of signs capable of displaying multiple images include "tri-vision" signs which present a series of images through mechanical rotation of multi-sided vertical strips. The rotation occurs at regular intervals presenting a series of static images. Other forms are electronically produced, allowing for a wide range of colors, messages and images depending on the level of technology, and typically produced by light emitted by the sign face. Basic levels of technology present letters or numbers in a single color of light, such as "time and temperature" signs or gas pricing signs. Many of these signs can present longer images in a scrolling fashion, or can provide simple animations.

Recent advances have introduced a variety of technologies to the outdoor advertising arena. The largest impact has been made with LED signs which offer an inexpensive yet powerful approach that combines full motion, brilliant colors and a readable display. Other technologies are in development, including "digital ink" signs that offer a changeable medium on a surface that looks like a normal vinyl billboard. These signs manipulate ink on the surface, allowing for a dynamic presentation of images without being internally illuminated.

The various sign technologies are referenced by a wide array of terms: "changeable message signs," "electronic billboards," "animated signs." In general, this report focuses on the broad range of signage types which are capable of displaying multiple images through electronic manipulation, which we will refer to as "dynamic" signing. Reference to specific signage types is made when necessary to discussion of specific issues (e.g. the brightness of LED signage).

PRELIMINARY DRAFT FOR REVIEW BY CITY OF MINNETONKA
Further changes are anticipated following Signage Workshop

*****Preliminary Report is specific to City of Minnetonka issues and may not be sufficient to address concerns in other communities*****

Appendix B

Outdoor Advertising Sign Brightness Definitions

PRELIMINARY DRAFT FOR REVIEW BY CITY OF MINNETONKA
Further changes are anticipated following Signage Workshop

*****Preliminary Report is specific to City of Minnetonka issues and may not be sufficient to address concerns in other communities*****

Appendix B – Outdoor Advertising Sign Brightness Definitions

This appendix defines various technical terms that are used to describe the operational aspects of electronic billboards.

Billboard Illuminance

Billboard illumination is typically discussed using two terms: illuminance and luminance. Because this section includes some technical jargon, a glossary that further defines terms used in outdoor advertising is provided in Appendix C.

Illuminance: The amount of light that is incident to the surface of an object. This is the method for describing ambient light levels or the amount of light that is projected onto a front-lit sign. This parameter is typically measured in lux (footcandles x meters). For the purposes of dimming, illuminance is discussed to describe the ambient light that hits the photocell.

Luminance: The amount of light that emanates from an internally illuminated sign. This parameter is measured in nits. The nit levels necessary for the sign to be legible vary with the ambient light conditions. On a sunny day, the nit levels must be very high, while at night, the levels must be very low to prevent the image from distorting and to prevent glare.

Billboard Luminance (Brightness)

Luminance is measured in nits (candelas/square meter) and describes how bright the image is. In essence, it is the amount of light that is radiated from the sign divided by the amount of surface area of the sign. No matter how big the sign is, the luminance of the sign is consistent. For example, the brightness of computer monitors is also measured in nits.

The European standard "EN 12966" specifies that at certain ambient light levels, the sign should output a given number of nits. There are different tables for each color due to the properties of how the human eye interprets each color. The color that is most often used to set dimming levels is white.

The FHWA has developed recommended practices for dynamic message signs installed within the roadway right-of-way. The standard is NEMA's TS-4 "Hardware Standards for Dynamic Message Signs (DMS) With NTCIP Requirements." Note that these standards were prepared for message signs deployed within the roadway right-of-way and should not be taken as recommended luminance levels for advertising signs. Table A-1 provides a simplified version of the NEMA TS-4 standard for the color white.

PRELIMINARY DRAFT FOR REVIEW BY CITY OF MINNETONKA
Further changes are anticipated following Signage Workshop

*****Preliminary Report is specific to City of Minnetonka issues and may not be sufficient to address concerns in other communities*****

Table A-1 - Luminance Standards

Ambient Light (lux)	Approximate Light	Minimum Luminance (nits)	Maximum Luminance (nits)
40,000	Sunlight	12,400	62,000
10,000	Cloudy	12,400	-
4,000	Overcast	2,200	11,000
400	Sunrise/Sunset	600	3,000
40	Candlelight	250	1,250
less than 4	Moonlight	75	375

Source: NEMA TS-4 (2005)

Billboard Resolution

Billboards require far less resolution than print advertisements. For example, Clear Channel's LED "Digital Outdoor Network" LED bulletin-size (14' x 48') billboards require dimensions of only 208 pixels high by 720 pixels wide. If this image were to be printed at 300 dots per inch (dpi), a typical print resolution, the entire image would be less than 1.7 square inches. Therefore, it is ideal to keep the message on these signs simple and clear because they do not currently allow resolutions similar to printed images.

Dimming

To maintain readability, the brightness of a sign must be adjusted to match ambient light conditions. If this is not done, the image will appear too bright and can even degrade the image quality through a phenomenon called "blooming." If the image blooms, the brightest areas of the image bleed over into darker parts and the image clarity is degraded.

Dimming is typically controlled by a photocell, which measures the ambient light conditions and varies the light output of the sign based on preconfigured settings. As ambient light conditions darken, the photocell senses the decrease and lowers the light output of the sign. Some sign manufacturers do not incorporate photocells in their electronic signs.

Electronic billboard dimming can also be controlled by scheduled dimming according to time of day or manual dimming. On-premise signs may use any of these methods, but most, if not all, off-premise standard size electronic billboards are auto dimmed by photocell. Some signs include user-defined dimming curve capability allowing total control over sign brightness and adjustability to accommodate local brightness ordinances.

PRELIMINARY DRAFT FOR REVIEW BY CITY OF MINNETONKA
Further changes are anticipated following Signage Workshop

*****Preliminary Report is specific to City of Minnetonka issues and may not be sufficient to address concerns in other communities*****

Appendix C

Electronic Outdoor Advertising Device Visual Performance Definitions

PRELIMINARY DRAFT FOR REVIEW BY CITY OF MINNETONKA
Further changes are anticipated following Signage Workshop

*****Preliminary Report is specific to City of Minnetonka issues and may not be sufficient to address concerns in other communities*****

Appendix C – Electronic Outdoor Advertising Device Visual Performance Definitions

Conspicuity

Conspicuity is the property that related to the contrast between a sign and its background and its ability to stand out from its surroundings. This is a subjective property that depends on many factors of both the environment and the viewer.

Contrast

Contrast is the property that defines the relationship between the brightness of the brightest color possible to the darkest color possible on a sign. In times when ambient conditions are very bright, such as a sunny day, the darkest color may still be very bright due to the sun's reflection off the sign. In these cases, the lighter colored areas of the billboard's image must be much brighter than the contrasting dark areas.

Legibility

The ability of the driver to read a sign is related to its legibility. Large, legible text allows the driver to read the billboard from varying distances and focus on the driving task. Conversely, with small text the driver is more likely to focus on the sign for a longer period of time and possibly wait until the sign is very close.

State departments of transportation use NEMA's TS-4 document for this criterion. This document specifies many characteristics related to legibility including character height, resolution and color.

Glare

Disability Glare

The first form of glare is disability glare. This occurs when a driver is exposed to a light source so bright that it temporarily blinds the driver, impairing their ability to perform driving tasks. This temporary blindness is brief, but can be dangerous.

Discomfort Glare

Discomfort glare is when a light source is bright enough to distract or encourage the driver to look away from the light, but is not blinding. Discomfort glare is of particular concern in cases where a bright sign is located in the same line of sight as a traffic sign, signal or another vehicle.

PRELIMINARY DRAFT FOR REVIEW BY CITY OF MINNETONKA
Further changes are anticipated following Signage Workshop

*****Preliminary Report is specific to City of Minnetonka issues and may not be sufficient to address concerns in other communities*****

Frequency of Change

The frequency of change is determined by the interval of time between sign image changes. The rate of change can usually be adjusted by the owner and operator of the sign. Frequency of change is highly variable, with some on-premise signs changing faster than once per second. While no standard is generally accepted, local government agencies have used ordinances to limit the frequency to anywhere from 5 seconds to 24 hours.

Interactive signs

Interactive signs change their message based on the person viewing it. For example, the carmaker MINI has installed variable message signs that display a customized message to car owners who have special key dongles containing a radio frequency identification (RFID) chips when the dongle is in close proximity to the sign.

Another example is a microphone system that identifies the radio stations passing drivers are listening to and displays a specific message for that station.

[1] B. Wallace, "Driver Distraction by advertising: genuine risk or urban myth?" Proceedings of the Institution of Civil Engineers, Municipal Engineer 156, 2003.

[2] J. Wachtel, and R. Netherton. "Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage. Report No. FHWA-RD-80-051," Washington, D.C., 1980.

[3] A.R. Lauer and J.C. Mcmonagle, "Do Road Signs Affect Accidents?" Eno Transportation Foundation, 1955.

[4] D. Faustman, "A study of the relationship between advertising signs and traffic accidents on U.S. 40 between Vallejo and Davis." San Francisco: California Roadside Council, Report CRC No. 165, 1961.

[5] S. Weiner. "Review of report." Washington, D.C.: Federal Highway Administration, Environmental Design and Control Division, August 1973.

[6] J. Wachtel, and R. Netherton. "Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage. Report No. FHWA-RD-80-051," Washington, D.C., 1980.

[7] D. Crundall et al., "Attraction and Distraction of Attention with Roadside Advertisements," Elsevier, 2006.

[8] D. Beijer and A. Smiley, "Observed Driver Glance Behavior at Roadside Advertising Signs," Transportation Research Record, 2005.

[9] A. Smiley et al., "*Impact of Video Advertising on Driver Fixation Patterns.* Transportation Research Record, 2004.

[10] G. Wachtel, The Veridian Group, "*Video Signs in Seattle – Final Report.*" 2001.

[11] J. Wachtel, and R. Netherton. "Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage. Report No. FHWA-RD-80-051," Washington, D.C., 1980.

[12] C. L. Dudek et al., "Impacts of Using Dynamic Features to Display Messages on Changeable Message Signs," Operations Office of Travel Management: Federal Highway Administration, Washington, D.C., 2005.

[13] "NHTSA Driver Distraction Forum: Summary and Proceedings," <http://www-nrd.nhtsa.dot.gov/pdf/ nrd-13/FinalInternetForumReport.pdf>, accessed on February 14, 2007.

[14]"Report of the Road Safety Committee on the Inquiry into Driver Distraction," Parliament of Victoria, Australia, Victoria, Australia, 2006, p. 110.

[15] A.W. Johnston and B.L. Cole, "Investigations of Distraction By Irrelevant Information," Australian Road Research Board, 1976.

[16] S.G. Klauer et al., "*Impact of Driver Inattention on Near-Crash/Crash Risk: An Analysis Using the 100-Car Naturalistic Driving Study Data*," National Highway Traffic Safety Administration, 2006.

[17] Driver Inattention Is A Major Factor In Serious Traffic Crashes," <http://www.nhtsa.dot.gov/people/ outreach/traftech/TT243.htm>, accessed on February 14, 2007.

[18] J. Wang, "Role of Driver Inattention in Crashes; New Statistics from the 1995 Crashworthiness Data System, 40th Annual Proceedings, Association for the Advancement of Automotive Medicine, Vancouver, British Columbia, 1996.

[19] University of North Carolina Highway Safety Research Center, "The Role of Driver Distraction in Traffic Crashes,"2001.

[20] K. Harder, "The Effectiveness and Safety of Traffic and Non-Traffic Related Messages Presented on Changeable Message Signs (CMS)", Minnesota Department of Transportation, St. Paul, Minnesota, 2003.

[21] "*Decision of the Outdoor Advertising Board in the Matter of John Donnelly & Sons, Permitee, Telespot of New England, Inc., Intervenor, and Department of Public Works, Intervenor, with Respect to Permit Numbered 19260 as Amended*," The Commonwealth of Massachusetts Outdoor Advertising Division, 1976.

[22] Wisconsin Department of Transportation (1994). Milwaukee County Stadium Variable Message Sign Study. Wisconsin, USA: Internal Report, Wisconsin Department of Transportation.

[23] T. Szymkowski, University of Wisconsin, Madison, Interviewed on February 20, 2007.

[24] Federal Highway Administration, "Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction," 2001.

[25] G. Davis, FHWA Office of Safety Research and Development, Interviewed on February 23, 2007.

[26] CTC & Associates LLC, "Electronic Billboards and Highway Safety, <"http://www.dot.wisconsin.gov/library/ research/docs/tsrs/tsrelectronicbillboards.pdf>, accessed on February 14, 2007.

[27] Federal Highway Administration, "Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction," 2001.

[28] "Report of the Road Safety Committee on the Inquiry into Driver Distraction," Parliament of Victoria, Australia, Victoria, Australia, 2006.

[29] D. Mandelker, A. Bertucci and W. Ewald. "Street Graphics and the Law," APA Planning Advisory Service, 2004, pp. 51-55.

ORDINANCE NO. 2007-

AN ORDINANCE AMENDING CITY CODE SECTION 300.30 REGARDING DYNAMIC SIGNS

The City of Minnetonka Ordains:

Section 1. City code §300.30, subd. 1 is amended as follows:

1. Purpose and Findings.

The purpose and findings of the sign ordinance are as follows:

a) Purpose: the sign ordinance is intended to establish a comprehensive and balanced system of sign control that accommodates the need for a well-maintained, safe, and attractive community, and the need for effective communications including business identification. It is the intent of this section, to promote the health, safety, general welfare, aesthetics, and image of the community by regulating signs that are intended to communicate to the public, and to use signs which meet the city's goals by authorizing:

1) permanent signs which establish a high standard of aesthetics;

2) signs which are compatible with their surroundings;

3) signs which are designed, constructed, installed and maintained in a manner that does not adversely impact public safety or unduly distract motorists;

4) signs which are large enough to convey the intended message <u>and to help citizens find their way to intended destinations</u>;

5) signs that are proportioned to the scale of, and are architecturally compatible with, principal structures;

6) permanent signs which give preference to the on-premise owner or occupant; and

7) temporary commercial signs and advertising displays which provide an opportunity for grand openings and occasional sales events while restricting signs which create continuous visual clutter and hazards at public right-of-way intersections.

b) Findings: the city of Minnetonka finds it is necessary for the promotion and preservation of the public health, safety, welfare and aesthetics of the community that the construction, location, size and maintenance of signs be controlled. Further, the city

---

The ~~stricken~~ language is deleted; the <u>underlined</u> language is inserted.

finds:

1) permanent and temporary signs have a direct impact on and relationship to the image of the community;

2) the manner of installation, location and maintenance of signs affects the public health, safety, welfare and aesthetics of the community;

3) an opportunity for viable identification of community businesses and institutions must be established;

4) the safety of motorists, cyclists, pedestrians and other users of public streets and property is affected by the number, size, location and appearance of signs that unduly divert the attention of drivers;

5) installation of signs suspended from, projecting over, or placed on the tops of buildings, walks or other structures may constitute a hazard during periods of high winds and an obstacle to effective fire-fighting and other emergency service;

6) uncontrolled and unlimited signs adversely impact the image and aesthetic attractiveness of the community and thereby undermine economic value and growth;

7) uncontrolled and unlimited signs, particularly temporary signs which are commonly located within or adjacent to public right-of-way or are located at driveway/street intersections, result in roadside clutter and obstruction of views of oncoming traffic. This creates a hazard to drivers and pedestrians and also adversely impacts a logical flow of information;

8) commercial signs are generally incompatible with residential uses and should be strictly limited in residential zoning districts; and

9) the right to express noncommercial opinions in any zoning district must be protected, subject to reasonable restrictions on size, height, location and number.

Section 2. City code §300.02, subd. 2, is amended by the deletion of the following definitions and the re-numbering of the remaining clauses consecutively.

~~"Message center/time and temperature display" – a sign having electrically changing copy which displays current time, temperature, and/or public service announcements.~~

~~"Public service announcement" – any sign display intended primarily to promote~~

~~items of general interest to the community such as time, temperature, date, atmospheric conditions, Dow Jones industrial average, news, etc. This does not include any information which would be related to commercial products or services located at the display site.~~

~~"Readerboard sign" – any sign having a message not permanently affixed to the sign face and the copy is manually changed.~~

Section 3. City code §300.30, subd. 2, is amended by the addition of the following definition which is to be inserted alphabetically and the following clauses renumbered consecutively:

"Dynamic display" –any characteristics of a sign that appear to have movement or that appear to change, caused by any method other than physically removing and replacing the sign or its components, whether the apparent movement or change is in the display, the sign structure itself, or any other component of the sign. This includes a display that incorporates a technology or method allowing the sign face to change the image without having to physically or mechanically replace the sign face or its components. This also includes any rotating, revolving, moving, flashing, blinking, or animated display and any display that incorporates rotating panels, LED lights manipulated through digital input, "digital ink" or any other method or technology that allows the sign face to present a series of images or displays.

Section 4. City code §300.30, subd 4(a) is amended as follows:

a) Monument identification signs:

1) one sign per development;

2) maximum copy and graphic area as follows:

width of adjacent right-of-way	copy and graphic area
less than 100 feet	36 square feet
100 feet or greater	50 square feet

3) maximum monument area is two times the potential copy and graphic area;

4) copy and graphic display limited to three items of information; (Figure 30-16)

Figure 30-16

5) 15 foot maximum height; and

6) signs which are not internally illuminated shall have light fixtures and sources screened from view~~; and~~

~~7) message centers/time and temperature displays permitted but the maximum area for display is 50 percent of the potential copy and graphic area of the monument identification sign~~.

Section 5. City Code §300.30, subd. 10 is amended as follows:

10. Prohibited Signs.

The following types of signs are expressly prohibited in all districts:

a) roof signs including signs mounted on a roof surface or projecting above the roof line of a structure if either attached to the structure or cantilevered over the structure;

~~b) revolving and moving signs except electronic message center/time and temperature display signs according to subdivision 4 and search lights according to subdivision 8;~~

~~c~~b) ~~flashing, blinking or animated signs including but not limited to traveling lights or any other means not providing constant illumination except electronic message center/time and temperature display signs according to subdivision 4 and search lights according to subdivision 8~~signs with dynamic displays except search lights under subdivision 8 and those allowed under subdivision 14;

~~d~~c) portable signs, except temporary signs that are specifically permitted in section 300.30;

~~e~~d) projecting signs. Wall signs shall be mounted parallel to the building and shall not project more than 18 inches from the face of the building;

~~f~~e) painted wall signs including signs painted on the face of a structure. Works of art

which are not commercial messages are exempt;

~~g~~f) signs attached to trees and utility poles;

~~h~~g) signs within public right-of-way except for official traffic signs and those specified in subparagraph 9(k) and (l);

~~i~~h) signs which are designed to resemble official traffic signs except signs which are used to control traffic on private property;

~~j~~i) abandoned signs or signs other than outdoor advertising structures that advertise an activity, business, product or service no longer available on the premises on which the sign is located;

~~k~~j) signs attached to fences except athletic field fence panels according to subdivision 1;

~~l~~k) illuminated signs which exhibit any of the following:

1) external illumination that is determined to interfere with safe traffic operations;

2) the sign is directly oriented to any residential district;~~ or~~

3) illumination of a commercial sign in a residential district, except a sign used for a conditionally permitted use; or

4) the level of illumination exceed standards specified in section 300.28, subd. 2.

~~m~~l) signs that obstruct the vision of pedestrians, cyclists, or motorists traveling on or entering public streets;

~~n~~m) exterior signs that obstruct any window, door, fire escape, stairway or opening intended to provide light, air, ingress or egress for any structure;

~~o~~n) signs that are in violation of the building code or the electrical code adopted by the city;

~~p~~o) blank signs;

~~q~~p) merchandise boxes or signs not affixed to a principal structure excluding signs

permitted in subdivision 8(d);

~~f~~g) outdoor advertising signs are not permitted in any zoning district, except that the provisions of this paragraph do not apply to temporary outdoor advertising signs permitted under Subd. 9 (k) above. Outdoor advertising signs which exist on the effective date of this section shall be considered as nonconforming signs and are subject to standards contained in section 300.29. An outdoor advertising sign is a principal use of property. No permitted or conditionally permitted use or any part of such use may be located on the same parcel of property as such a sign. The parcel on which such a sign is located may not be subdivided to segregate the sign from the remaining property. For the purposes of this paragraph, "parcel of property" means any property for which one property identification number has been issued by the county, or all contiguous property in common ownership as of October 15, 1997, whichever is greater; and

~~s~~r) any sign not expressly permitted by the provisions in section 300.30.

Section 6. City code §300.30 is amended by the addition of a new subdivision 14 to read as follows:

14. Dynamic Displays.

a) **Findings.** Studies show that there is a correlation between dynamic displays on signs and the distraction of highway drivers. Distraction can lead to traffic accidents. Drivers can be distracted not only by a changing message, but also by knowing that the sign has a changing message. Drivers may watch a sign waiting for the next change to occur. Drivers are also distracted by messages that do not tell the full story in one look. People have a natural desire to see the end of the story and will continue to look at the sign in order to wait for the end. Additionally, drivers are more distracted by special effects used to change the message, such as fade-ins and fade-outs. Finally, drivers are generally more distracted by messages that are too small to be clearly seen or that contain more than a simple message. Time and temperature signs appear to be an exception to these concerns because the messages are short, easily absorbed, and become inaccurate without frequent changes.

Despite these public safety concerns, there is merit to allowing new technologies to easily update messages. Except as prohibited by state or federal law, sign owners should have the opportunity to use these technologies with certain restrictions. The restrictions are intended to minimize potential driver distraction and to minimize proliferation in residential districts where signs can adversely impact residential character.

Local spacing requirements could interfere with the equal opportunity to use such technologies and are not included. Without those requirements, however, there is the potential for numerous dynamic displays to exist along any roadway. if more than one dynamic display can be seen from a given location on a road, the minimum display time becomes critical. If the display time is too short, a driver could be subjected to a view that appears to have constant movement. This impact would obviously be compounded in a corridor with multiple signs. If dynamic displays become pervasive and there are no meaningful limitations on each sign's ability to change frequently, drivers may be subjected to an unsafe degree of distraction and sensory overload. Therefore, a longer display time is appropriate.

A constant message is typically needed on a sign so that the public can use it to identify and find an intended destination. Changing messages detract from this way-finding purpose and could adversely affect driving conduct through last-second lane changes, stops, or turns, which could result in traffic accidents. Accordingly, dynamic displays generally should not be allowed to occupy the entire copy and graphic area of a sign.

In conclusion, the city finds that dynamic displays should be allowed on signs but with significant controls to minimize their proliferation and their potential threats to public safety.

b) **Regulations.** Dynamic displays on signs are allowed subject to the following conditions:

1) Dynamic displays are allowed only on monument and pylon signs for conditionally permitted uses in residential districts and for all uses in other districts. Dynamic displays may occupy no more than 35 percent of the actual copy and graphic area. The remainder of the sign must not have the capability to have dynamic displays even if not used. Only one, contiguous dynamic display area is allowed on a sign face;

2) A dynamic display may not change or move more often than once every 20 minutes, except one for which changes are necessary to correct hour-and-minute, date, or temperature information. Time, date, or temperature information is considered one dynamic display and may not be included as a component of any other dynamic display. A display of time, date, or temperature must remain for at least 20 minutes before changing to a different display, but the time, date, or temperature information itself may change no more often than once every three seconds;

3) The images and messages displayed must be static, and the transition

from one static display to another must be instantaneous without any special effects;

4) The images and messages displayed must be complete in themselves, without continuation in content to the next image or message or to any other sign;

5) Every line of copy and graphics in a dynamic display must be at least seven inches in height on a road with a speed limit of 25 to 34 miles per hour, nine inches on a road with a speed limit of 35 to 44 miles per hour, 12 inches on a road with a speed limit of 45 to 54 miles per hour, and 15 inches on a road with a speed limit of 55 miles per hour or more. If there is insufficient room for copy and graphics of this size in the area allowed under clause 1 above, then no dynamic display is allowed;

6) Dynamic displays must be designed and equipped to freeze the device in one position if a malfunction occurs. The displays must also be equipped with a means to immediately discontinue the display if it malfunctions, and the sign owner must immediately stop the dynamic display when notified by the city that it is not complying with the standards of this ordinance;

7) Dynamic displays must comply with the brightness standards contained in subdivision 15;

8) Dynamic displays existing on (insert the effective date of this ordinance) must comply with the operational standards listed above. An existing dynamic display that does not meet the structural requirements in clause 1 may continue as a non-conforming development subject to section 300.29. An existing dynamic display that cannot meet the minimum size requirement in clause 5 must use the largest size possible for one line of copy to fit in the available space.

c) **Incentives.** Outdoor advertising signs do not need to serve the same way-finding function as do on-premises signs. Further, outdoor advertising signs are no longer allowed in the city, and there is no potential that they will proliferate. Finally, outdoor advertising signs are in themselves distracting and their removal serves public safety. The city is extremely limited in its ability to cause the removal of those signs. This clause is intended to provide incentives for the voluntary and uncompensated removal of outdoor advertising signs in certain settings. This removal results in an overall advancement of one or more of the goals set forth in this section that should more than offset any additional burden caused by the incentives. These provisions are also based on the recognition that the incentives create an opportunity to consolidate outdoor advertising services that would otherwise remain distributed throughout the community.

1) A person may obtain a permit for an enhanced dynamic display on one face of an outdoor advertising sign if the following requirements are met:

(a) The applicant agrees in writing to permanently remove, within 15 days after issuance of the permit, at least two other faces of an outdoor advertising sign in the city that are owned or leased by the applicant, each of which must satisfy the criteria of parts (b) through (d) of this subsection. This removal must include the complete removal of the structure and foundation supporting each sign face. The applicant must agree that the city may remove the sign if the applicant does not timely do so, and the application must be accompanied by a cash deposit or letter of credit acceptable to the city attorney sufficient to pay the city's costs for that removal. The applicant must also agree that it is removing the sign voluntarily and that it has no right to compensation for the removed sign under any law.

(b) The city has not previously issued an enhanced dynamic display permit based on the removal of the particular faces relied upon in this permit application.

(c) Each removed sign has a copy and graphic area of at least 288 square feet and satisfies two or more of the following additional criteria:

(1) The removed sign is located adjacent to a highway with more than two regular lanes and with a general speed limit of 45 miles per hour or greater, but that does not have restrictions on access equivalent to those of an interstate highway;

(2) All or a substantial portion of the structure for the removed sign was constructed before 1975 and has not been substantially improved;

(3) The removed sign is located in a noncommercial zoning district;

(4) The removed sign is located in a special planning area designated in the 1999 comprehensive plan; or

(5) The removed copy and graphic area is equal to or or greater than the area of the copy and graphic area for which the enhanced dynamic display permit is sought.

(d) If the removed sign face is one for which a state permit is required by state law, the applicant must surrendered its permit to the state upon removal of the sign. The sign that is the subject of the enhanced dynamic display permit cannot begin

to operate until proof is provided to the city that the state permit has been surrendered.

(e) The applicant must agree in writing that no dynamic displays will ever be used on one additional outdoor advertising sign that has a copy and graphic area of at least 288 square feet in size. This agreement will be binding on the applicant and all future owners of the sign. If the sign is subsequently removed or destroyed and not replaced, the holder of the enhanced dynamic display permit is not required to substitute a different sign for the one that no longer exists.

2) If the applicant complies with the permit requirements noted above, the city will issue an enhanced dynamic display permit for the designated outdoor advertising sign. This permit will allow a dynamic display to occupy 100 percent of the potential copy and graphic area and to change no more frequently than once every eight seconds. The designated sign must meet all other requirements of this ordinance.

Section 7. City code §300.30 is amended by the addition of a new subdivision 15 to read as follows:

15. Brightness Standards.

a) All signs must meet the following brightness standards in addition to those in subdivision 10:

1) No sign may be brighter than is necessary for clear and adequate visibility.

2) No sign may be of such intensity or brilliance as to impair the vision of a motor vehicle driver with average eyesight or to otherwise interfere with the driver's operation of a motor vehicle.

3) No sign may be of such intensity or brilliance that it interferes with the effectiveness of an official traffic sign, device or signal.

b) The person owning or controlling the sign must adjust the sign to meet the brightness standards in accordance with the city's instructions. The adjustment must be made immediately upon notice of non-compliance from the city. The person owning or controlling the sign may appeal the city's determination through the following appeal procedure:

1) After making the adjustment required by the city, the person owning or controlling the sign may appeal the city's determination by delivering a written appeal to the city clerk within 10 days after the city's non-compliance notice. The written appeal

must include the name of a person unrelated to the person and business making the appeal, who will serve on the appeal panel.

2) Within five business days after receiving the appeal, the city must name a person who is not an official or employee of the city to serve on the appeal panel. Within five business days after the city names its representative, the city's representative must contact the sign owner's representative, and the two of them must appoint a third member to the panel, who has no relationship to either party.

3) The appeal panel may develop its own rules of procedure, but it must hold a hearing within five business days after the third member is appointed. The city and the sign owner must be given the opportunity to present testimony, and the panel may hold the hearing, or a portion of it, at the sign location. The panel must issue its decision on what level of brightness is needed to meet the brightness standards within five business days after the hearing commences. The decision will be binding on both parties.

c) All signs installed after (insert the effective date of this ordinance) that will have illumination by a means other than natural light must be equipped with a mechanism that automatically adjusts the brightness in response to ambient conditions. These signs must also be equipped with a means to immediately turn off the display or lighting if it malfunctions, and the sign owner or operator must immediately turn off the sign or lighting when notified by the city that it is not complying with the standards in this section.

Section 8. A violation of this ordinance is subject to the penalties and provisions of Chapter XIII of the city code.

Section 9. This ordinance is effective upon adoption.

Adopted by the city council of the City of Minnetonka, Minnesota, on June 25, 2007.

_____

Janis A. Callison, Mayor

ATTEST:

David E. Maeda, City Clerk

ACTION ON THIS ORDINANCE:

Date of introduction:
Date of adoption:
Motion for adoption:
Seconded by:
Voted in favor of:
Voted against:
Abstained:
Absent:
Ordinance adopted.

Date of publication:

CERTIFIED COPY:

I certify that the foregoing is a correct copy of an ordinance adopted by the city council of the City of Minnetonka, Minnesota, at a meeting held on June 25, 2007.

David E. Maeda, City Clerk

From: Roger Brown [RBrown@daktronics.com]
Sent: Wednesday, May 30, 2007 3:16 PM
To: Janis Callison; Dick Allendorf; Terry Schneider; Bob Ellingson; Tony Wagner; Brad Wiersum; Al Thomas; shart@eminnetonka.com; mbrandt@eminnetonka.com; sadams@eminnetonka.com; jcheleen@eminnetonka.com; mdahl@eminnetonka.com; plehman@eminnetonka.com; sschmitz@eminnetonka.com
Cc: Kelly Koenig; Adam Skare; Erik Minge; Julie Wischnack; Cindy Gray; Roger Brown
Subject: Minnetonka sign ordinance

After attending the May 14th Minnetonka City Council Study Session, I felt compelled to write a letter noting my concerns about the manner in which the city is planning on regulating dynamic signs.

I applaud the city staff and the SRF Consulting Group for their interest in speaking with Daktronics and allowing us to be a part of the discussion. Our advice regarding the proper regulation of dynamic signs, however, does not seem to be filtering through. Since we were not allowed to speak to the council members present at the May 14th meeting, this letter is to provide some background on our positions regarding regulations of dynamic signs.

The current plan to "overlay" the new dynamic sign provisions onto the city's existing sign regulations is sound. The current code gives a strong basis upon which to build and adapt to the new technologies available, as well as those to be developed in the future.

To begin, there does need to be a difference between regulations for on-premise and off-premise signs as these signs are tools that require different parameters to communicate properly.

The city announced a proposed plan at the May 14th meeting to allow some off-premise signs (billboards) to become dynamic and change a static image every 8 seconds. This 8 second hold time is appropriate and in line with Federal and State safety studies.

The city staff, however, recommends that all other dynamic signs be restricted to a 20 minute hold time. The thinking behind such a lengthy hold time was concern over the signs becoming pervasive and drivers being "subjected to an unsafe degree of distraction and sensory overload." This concern is misplaced and not an appropriate basis for regulating dynamic signs.

First off, these signs are expensive and it is unlikely that there will be many areas where multiple dynamic signs will be seen on a single city block. Secondly, there is no reason to regulate on-premise signs with longer hold times than off-premise signs. In fact, logically, the opposite is true. Off-premise signs are traditionally larger with more signage area. This allows the sign owner to communicate a complete message in one frame. On-premise signs are smaller, however, and multiple frames may be necessary to communicate even the most concise of messages.

This point is pushed even farther due to other conflicting regulations. The city staff is recommending that only a portion of an on-premise sign may be dynamic. This further limits the sign face area. Add to this the idea that was floated of requiring a certain minimum font size, regardless of the distance of the sign to the public, and the ability of a sign owner to communicate a message with only one frame is virtually negligible.

Another point regarding minimum hold times: it was noted in the May 14th materials that time and temperature signs were an exception found by the federal court for hold times. This is a misreading of the law. The courts have not simply exempted time and temperature signs because of their public service background. The current law is that dynamic message centers should not be regulated based on the content of the sign. When cities create a loophole to allow certain content lesser regulation, they are unconstitutionally infringing on the 1st amendment rights of the sign owner.

Adopting a 20 minute standard for no other reason than that it is a standard another city has adopted is not a good enough reason for denying businesses such an important asset. The Small Business Administration has found that dynamic signs increase sales anywhere from 15-150%. These added sales not only increase the business owner's business, but increase tax revenues for the city as well.

A proper regulation of on-premise signs would be a hold time of one second. This would stop the flashing signs that are most aesthetically displeasing, while allowing a sign owner the ability to speak to the public. No minimum font size or maximum portion of a sign face's area should be included. Some provision might also be added to allow animations and even video at locations where the community deems them appropriate. Finally, a suggestion has been raised of instituting a requirement that the name of the business be a part of the sign face. This, again, is a content specific regulation and would be found unconstitutional.

One last note on safety: the city staff repeatedly refers to a dynamic sign's potential for being distracting. This is not a proper basis for regulations. Many things in this world may become a distraction; including listening to the radio and having kids in the car, but that does not give a municipality the power to legislate against such behavior. A city must have a factual basis to show that it is counteracting a shown harm. As the city staff has acknowledged, these signs have been studied repeatedly and no safety hazard has been found. The repeated references to distractions are not an appropriate foundation for regulations.

Once again, thank you for the opportunity to be involved in this matter. Please feel free to contact me with any questions you have in this matter.

Sincerely,

Roger Brown
Signage Legislation
Daktronics

B. An ordinance amending City Code Section 300.30 regarding dynamic signs (97054.07a)

Acting Chair Cheleen introduced the proposal and called for the staff report.

Wischnack reported. She recommended approval of the application based on the findings.

Cheleen asked if an existing dynamic sign would be grandfathered, exempt, from the ordinance. Wischnack explained that an existing dynamic sign would be considered nonconforming and that if the owner wanted to expand the sign, it would have to comply with the existing ordinance. The next step in the process would be to amend controls regarding message content.

In response to Cheleen's question, Wischnack will find out if the three-person panel would need to be unanimous in its decisions or if a majority would be sufficient.

Cheleen asked if the dynamic sign, traded for two static signs, would have to be located where one of the two static signs was located. Wischnack explained the rationale for the amendment.

Lehman asked how the permanent portion of a sign is defined and if it could be changed. Wischnack explained that in order to replace a sign, a permit would be required. A permanent sign face replacement would also require a sign permit. The permanent portion could not be dynamic.

Lehman asked how the ordinance would relate to an application for a permanent, totally electronic sign. Wischnack will discuss that point with the city attorney. Cheleen commented that back lighting may be considered dynamic.

Rankin explained the intent of the ordinance. Wischnack explained that allowing a percentage of the sign to be changed on a regular basis would be done to provide recognition for people trying to find their way to businesses.

Lehman asked why a permanent sign would have to be paint and wood and not electronic. He wanted to understand the rationale. Wischnack will review the issue with the city attorney to make sure that is covered.

Schmitz reviewed that up to 35 percent of a sign could be dynamic. Lehman did not see a definition of a permanent, static sign.

Schmitz stated that the Lecy Brothers Home sign is smaller than what is allowed. She questioned if sign owners would want to increase the size of signs in order

to have 35 percent of it dynamic. Wischnack saw that possibility. There are no restrictions regarding limiting the size of a sign when replacing one.

In response to Schmitz's question, Wischnack stated that the amendments would only apply to pole signs and monument signs, not wall signs. A wall sign is not allowed to be dynamic.

Adams was most concerned with the Clear Channel billboards on Interstate 394. Wischnack explained that the billboards are considered nonconforming signs and are prohibited. A current lawsuit is in the settlement phase.

Wischnack explained that removing two signs would provide some benefit and could be traded for one sign that could be up to 100 percent dynamic and allowed to change every 8 seconds. A new permit would not be granted for an outdoor advertising sign.

Adams asked if the ordinance would result in Clear Channel having a monopoly in Minnetonka for billboards. Rankin confirmed that, coincidentally, Clear Channel currently owns many outdoor advertising signs. The result will end with an overall reduction for advertising signs.

Cheleen recognized another result would be that most of the signs would be located near the freeways.

Dahl asked if the ordinance would apply to signs on the back of trucks. Wischnack stated that the ordinance would not have jurisdiction over licensed vehicles traveling on roads. It also would not be applied to vehicles parked with the intent of being used primarily as a sign, but that is a good issue to consider.

The public hearing was opened.

Kelly Koenig, Brookings, South Dakota, applauded staff for considering an update to the sign ordinance. Many cities are doing the same and looking at Minnetonka's actions for guidance. He stated:

- Prohibitions and no restrictions would not be a good course.
- Performance based rather than technology based is brilliant.
- Signs are designed for "way finding" and for advertising. The sign owner would best determine what percentage of the sign should be used for identification.
- Technology changes. To stand the test of time, a static sign may be comprised of different materials.
- The 20-minute change should be the same for advertising and public service announcements. Content is irrelevant. An Anoka County Judge ruled an ordinance unconstitutional that prohibited

changing a message every 15 minutes except for time, temperature, and/or date because the restriction was content based.

- In order to get an entire thought across, a hardship would be created due to minimum character height and the sign restriction. It is his belief that the city would receive a number of requests for variances.
- The brightness portion of the proposal is perfect. If it appears too bright, then it probably is.

Lehman asked if Mr. Koenig represented a sign company. Mr. Koenig answered affirmatively. He worked for Daktronics, a manufacturer of electronic signs.

Lehman asked why an owner would want an electronic sign. Mr. Koenig explained that small business owners agree that electronic displays enable a business to advertise more economically than they can with any other type of medium. It can be owned, changed, and provides new advertising without having to change letters manually. That can be dangerous and cause property damage. One person would be able to operate a convenience store and change the gas price at the same time. It would make a business more profitable.

Lehman asked how the proposed ordinance would impact his business. Mr. Koenig explained that his business model would not change. The company would look for another city to sell signs in. Every business has a different frontage. One may only be able to fit two words to three words on the sign. To limit the physical size and the frequency of change would not be of much value to a business.

Gene Stageberg, Lake Street Extension, appreciates the low property taxes provided partially by successful businesses in Minnetonka. The sign a business is allowed to use is an important part of running a business. He disagreed with limiting electronic signs. The sign owner should be able to put what is most important to the business on the sign. The business owner invests money into the business and sign.

Roger Brown, Brookings, South Dakota, employed by Daktronics, stated that:

- He has been working with the city's consultants and looking at the ordinance as a whole. It has been a frustrating process.
- He did not believe that the ordinance is performance based and not technology based.
- There is no point to limit the dynamic portion of a sign to 35 percent. It would limit the amount of communication that a sign owner can communicate with the public. Electronic signs increase business by increasing communication with the public.

- The proposed ordinance's end result basically bans the company's products. It would be banning a medium of communication that is important to small and new businesses.
- It is almost silly for an ordinance to decide what the appropriate amount of area should be used to promote the name of a company. That determination is best left for the market place.
- To make a mandatory rule of how the sign could be used does not make sense. It would not be a good rule. It would be a content-based restriction.
- Clear Channel had something to bargain with. Small and new businesses are not here to argue that point, but it is a huge point when it comes to economics in the future. Sign owners are going to enter into a market that is already established, unable to communicate to the market as other establishments.
- There are situations where animation and video are appropriate. He left that for local communities to decide what to allow. He would not ban it everywhere in the city.
- He found it difficult to justify the 20-minute hold time. Billboards are allowed to change every 8 seconds. There is no argument that the changing messages would create a safety hazard. There has not been a study to determine if dynamic signs have a positive or negative impact on keeping drivers' alert.
- The proposed ordinance would be an attack on the sign industry and business. It is a substantial government interest. The proposed ordinance would regulate signs to the point that they would be banned and the purpose of having a dynamic sign would be defeated.
- This proposal is not the least restrictive way to appropriately regulate signs.
- Signs should be regulated for brightness and there should be a dimming capability.
- Aesthetics-based regulations need: a 1 second hold time per frame to stop any kind of flashing and prevent strictly eye-catching techniques rather than a communicative device and to allow animation in certain areas of the city.

Cheleen recalled that the ordinance does have a requirement regarding dimming. Wischnack provided the wording. Mr. Brown provided clarification of the methods available to dim a sign.

Cheleen suggested that reading part of a message, but not having the remainder of the message displayed prior to passing the sign would be distracting. Mr. Brown stated that no study has supported that theory. There still needs to be concise messages. Cheleen felt common sense indicated that a safety hazard would possibly be created by signs with scrolling messages.

Mr. Brown felt that on-premise signs should be regulated at a decreased amount. The 20-minute hold time makes no sense except to ban that type of sign.

Dahl asked if a market research study had been conducted. Mr. Brown did not know of market research. He is new to a fairly small company. The company's best practices guidelines are based on their business practices for the last 20 years.

Dahl asked Mr. Brown if he knew what percentage of small businesses use Daktronic's signs. Mr. Brown guessed it would be a small percentage. The signs are expensive and would not be affordable for numerous privately owned small businesses. Pharmacies and restaurants use the signs. The proposed ordinance would block on-premise signs that would otherwise be provided in the city.

Dahl stated that the Minnetonka High School sign and the Minnetonka City Hall signs communicate messages effectively with short messages. Mr. Brown stated that his business recommends the scrolling message be set up depending on the traffic speed, number of vehicles, and screening in the area. The one-second hold time prevents the most obtrusive use of the signs. A sign owner would understand the best way to use the sign. Dahl felt messages could be communicated and meet the proposed ordinance's requirements.

Dahl asked if businesses complained that products could not be advertised on signs. Wischnack stated that the proposed ordinance would address content based signs.

Mr. Brown stated that a meeting was held with the sign industry. A room full of people were concerned with the proposed changes to the ordinance. It would hurt the businesses.

John Baker, attorney who represents the City of Minnetonka, clarified:

- With one exception, dynamic signs have been denied flatly in Minnetonka for 41 years. That exception is for electronic message centers that provide time and temperature. Time and temperature exceptions are not content based. What makes time and temperature different is that it is the kind of information that becomes inaccurate if it is not allowed to change frequently. In its customary use, it is of the form that is least likely to distract because it is the kind of information that people are able to digest in a single glance. Public service information does not have as clear a determination.
- The city is considering creating an opportunity that right now does not exist and has not existed for 41 years for people to use signs as

described that would control the distraction in order to control the proliferation. The font requirements and the measurements came from the international sign association.

- The sign owner could use the sign to permanently advertise. The more important message is identifying the business. City's have the right to prefer the value of "way finding" over the value of the business because if it is allowed to cycle through messages frequently, it would increase the likelihood that when a motorist looks at that part of the sign he or she may miss the name and become lost.
- Proof of cause and effect is elusive in this field, but that does not preclude thoughtful regulation. Legitimate studies of sign safety conducted by parties who do not have a financial interest form the pieces of a broader puzzle. The SRF report helps demonstrate that the replacement of static signs by dynamic, frequently changing signs can create an added safety hazard. That is all that is needed to regulate them and has been allowing cities to do that for decades. There is reason to believe that billboards cause distraction and there is reason to believe that dynamic billboards distract drivers to a greater degree. When people expect something to change, they will look at it longer. The city has an absolute right and authority to write an ordinance to preclude that.
- The occasion in which a sign with a 20-minute hold changes would not be the pattern. The change would be the rare exception. That is how the safety consequences relate to the proposed ordinance changes.
- If the businesses placed the same weight on safety that the city does and subordinated the interest in letting the public know that a soft drink is on sale, there would not be a need for regulation. The police power exists because there are circumstances, just like this, in which there is a greater good.

Chris Erickson, 1225 Orono Oaks Drive, Orono, owns a business in Minnetonka. He stated that:

- He could see the point that a large retailer would have an advantage over a small business owner who could only have one sign at the one location.
- If a sign was not well lit, a person might have to strain to see and cause a traffic accident. He questioned if one complaint should be able to limit the brightness.

Adams asked Mr. Erickson his opinion regarding what would be appropriate regulations for a dynamic sign. Mr. Erickson understood the need for a safe environment; however, if a business owner puts a lot of money into the sign, he

or she should receive some benefit from it. If the safety issue is inconclusive, then the regulations would be a waste of time. It would definitely be worth regulating if it caused a safety hazard. He suggested waiting until there was a safety concern and then deal with the issue. Mr. Erickson was considering a dynamic sign, but was going to use the capital for something else. He understood the benefit of advertising products. Adams appreciated hearing from a business owner.

Mr. Brown responded to the report done by SRF and Mr. Baker's comments:

- Mr. Brown knew of a case in Fridley and one in New Hampshire that he felt indicated there was no nation wide settled case law.
- A business owner knows best what to include on the sign to drum up business. It should not be the city's place to mandate over two thirds of what a business owner's sign should say.
- No study has shown that dynamic signs cause safety hazards. Studies have shown that distractions that occur inside the vehicle are a greater concern.
- The number of billboards has already been limited. The dynamic signs are expensive and would not be that popular because many businesses would not be able to afford them.

Mr. Koenig stated that dynamic signs create awareness and increase "way finding." The signs have been around for decades. If there was a safety factor, then it would be in the news and restricted in many more places. A pharmaceutical company installed a dynamic sign and found that it increased the opening day's foot traffic by 30 percent. The signs do more good than negative. The two complaints relate to too bright at night and flashing messages. A minimum hold time of 1 second and limiting the night-time illumination with the use of a photo cell would create a very successful ordinance. Mr. Koenig would stare at a sign for 20 seconds to see the time and temperature.

No additional testimony was submitted and the hearing was closed.

Dahl felt that the studies may have been inconclusive because if there is a traffic accident, then a driver would not report to the city that it was caused by staring at a dynamic sign.

Lehman disclosed that he was involved in purchasing an electronic sign from Daktronics. He has no financial interest in the company. He felt that the proposed changes are leaning in the direction of solving more problems than exist. It might be going a little farther than he would expect in certain respects. The 20-minute hold changes the dynamic sign into a static sign. The individual view would get one message from the sign. He leaned toward allowing the sign to be 100 percent electronic.

Schmitz was distracted by dynamic signs she saw in another city. She did not pay attention to the light or turn arrow. She complimented staff for taking on the issue. Her recommendation would be to allow 35 percent of a sign allowed by ordinance to be dynamic. This would allow a smaller sign to have equal amount of dynamic space as that of a sign as large as the maximum allowed by ordinance. The changes would not regulate content. Billboards would need a large font size and be in areas predominantly utilized by businesses. On-site signs would be located close to residential areas, be more distracting, and the traffic patterns would create a lot more stopping and starting again.

Adams felt the safety issue needs to be considered. SRF provided reports that indicated increase crash rates in areas that had dynamic signs. He would consider increasing the dynamic area up to 50 percent. The 20-minute hold would not be fair to some businesses. He agreed with Schmitz that a more frequent change would create an issue. He noted that the Minnetonka City Hall sign would be nonconforming. Wischnack confirmed the sign is 67 percent dynamic and would become nonconforming. He would consider a larger dynamic area and shorter change duration.

Dahl concurred. He asked if another company or several other companies could advertise a product on a different business' sign. Mr. Baker stated that off-premises advertising currently was and would still be prohibited by the sign ordinance. The more variety allowed for a dynamic sign, the more a sign owner may push the envelope. A business in St. Louis Park has ads for AAA.com and a travel package on its dynamic sign. Because Georgia Tech stadium sells a particular soft drink, the department of transportation in Georgia said that it could advertise that soft drink on the dynamic sign. The off-premise and on-premise distinction becomes blurred. That equals challenges to enforcement and constitutional distinctions.

Brandt does not like the aesthetic impact billboards create. Advertising is important for businesses and needs to be controlled. He believed 20 minutes would be too long to wait for a change. He proposed a shorter time, 5 minutes to 7 minutes, be recommended to the city council.

Cheleen felt the city should error on the side of protecting public safety. There is free speech and the need for businesses to do well. The city council may want to take a closer look at restricting the dynamic area to 35 percent and decreasing the 20 minute hold time.

In response to Lehman's procedural question, Wischnack explained that the planning commission has the right to recommend changes to the proposed ordinance. Concerns regarding increasing the dynamic proportion; decreasing the 20 minute hold; and making sure the ordinance does not prohibit the content

of the permanent portion of the sign would be contained in staff's report. She suggested including the changes in the motion.

Lehman moved, second by Schmitz, to recommend that the city council adopt the ordinance found on pages A43-A54 of the staff report with the inclusion of statements of interest regarding modifications that are appropriate for consideration by the city council and modifications provided in the change memo dated June 14, 2007.

Lehman, Schmitz, Adams, Brandt, Dahl, and Cheleen voted yes. Hart was absent. Motion carried.

Rankin explained that staff will present the planning commission's discussion to the city council.

Lehman reiterated the issues: increasing the dynamic proportion; decreasing the 20 minute hold; and making sure the ordinance does not prohibit the content of the permanent portion of the sign.

Cheleen recognized the issue was not an easy one. It needs to be closely looked at by the city council. It is tentatively scheduled to be reviewed by the city council on June 25, 2007.

ATTACHMENT "K"

OAAA Digital Light PowerPoint Presentation

OAAA Digital Lighting Webinar

July 15, 2008

oaaa

Digital Lighting 101

Bill Ripp

Incoming Chairman, OAAA Digital Committee

oaaa

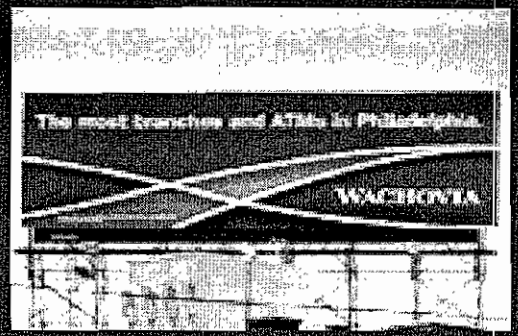
How does the digital light "work?"

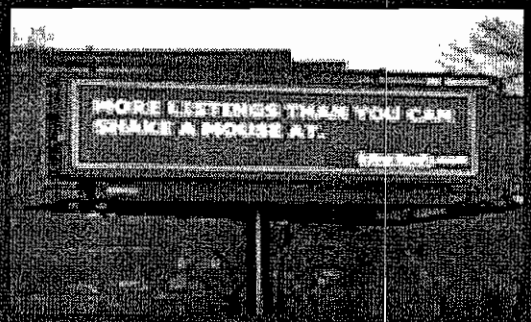
- *Normal Diode – Anode and Cathode legs*
- *Semiconductor materials doped with chemical impurities*
  - Gallium Arsenide = Red
  - Gallium Nitride = Green
- *Shape of LED encasement*
  - Physical Pixel
  - Surface Mount Pixel

OAAA

How is digital light measured?

- *Illuminance vs. luminance*





- *Viewing Angle vs. Luminance Output*

oaaa

What are some terms used when discussing digital light issues?

- *LED Displays*
- *Candelas/ Square meter – Also known as Nits*
- *Lux or Foot-candles*
- *Projectors*
- *Lumens*

OAAA

Why are foot-candles or lux preferred over candelas/meter when discussing LED lighting?

- *Ambient light conditions*
- *Cost of measurement equipment*
- *Based on standards from the Illuminating Engineering Society of North America (IESNA)*

oaaa

What equipment is used to measure digital light?

- *Candelas/Square meter is measured with a Luminance Meter or (Nit Gun)*
  - Cost of equipment can exceed $3,000
- *Foot Candles or Lux is measured with a light meter*
  - Cost of equipment around $300

OAAA

How much light is needed for nighttime visibility and legibility?

- *Varies widely based on ambient conditions*
  - Dark lightless areas – 300 nits or less
  - Brightly lit areas – 750 nits or more

OAAA

How does the OAAA lighting recommendations work?

- *Position Light meter at prescribed distance.*
- *Billboard Dimensions (ft.) Distance (f*

Poster	*150*
10.6 x 36	*200*
14 x 48	*250*
20 x 60	*350*

oaaa

- Run full black copy on LED display
- Take light measurement in foot-candles or Lux
- Run full white copy on LED display
- Take light measurement.
- Pass -If difference is less than or equal to 0.3 foot-candles or3.23 lux, brightness is good.
- Fail - If difference is more than 0.3 foot-candles or3.23 lux, brightness is too high and needs to be adjusted downward.

oaaa

Why does each sign need a light sensor or photocell?

- *Ambient Light Conditions – Clouds, Thunderstorms*
- *Sidereal time changes*

OAAA

Does digital light spill into the night sky?

- *Much Less than traditional bottom illuminated billboards*
- *Louvers*
- *Vertical viewing angles*

oaaa

Current Climate

- The overall regulatory environment nationally
- A summary of the FHWA memo from 9-25-07
- OAAA code of principles re: lighting
- Model language, per Bill Rinn's advice
- American Planning Association initiatives
- Tips to avoid mistakes

oaaa

State of the States

- *Currently 39 states allow some form of changeable message/digital technology*
- *Most recent states to clarify their rules: Indiana and Texas*

oaaa

Rules and Regulations

- *FHWA Memo*

- ***Proposed laws, regulations, and procedures that would allow permitting CEVMS subject to acceptable criteria (as described below) do not violate a prohibition against "intermittent" or "flashing" or "moving" lights as those terms are used in the various FSAs that have been entered into during the 1960s and 1970s.***

oaaa

OAAA Code

- *We are committed to ensuring that the commercial and noncommercial messages disseminated on standard-size digital billboards will be static messages and the content shall not include animated, flashing, scrolling, intermittent or full-motion video elements (outside established entertainment areas).*
- *We are committed to ensuring that the ambient light conditions associated with standard-size digital billboards are monitored by a light sensing device at all times and that display brightness will be appropriately adjusted as ambient light levels change.*

oaaa

Local Flavor

- *Approximately 300 local jurisdictions allow some form of changeable message/digital technology*
- *Two most recent cities to clarify their local ordinances were Milwaukee, WI and Tulsa, OK*

oaaa

Building-blocks of a Model Ordinance

- *Measurement criteria (.3 foot candles over ambient light levels)*
- *Not Clause (no flashing, scrolling, intermittent light or video)*
- *Light sensor unit*

OAAA

Avoid Pitfalls

- *Use foot candles not nits*
- *Watch out for local reinterpretation (to ban digital technology)*
- *Stay away from on-premise issues*
- *Stay informed about latest traffic safety research*

oaaa

Opposition Tactics

- *APA and has brightness recommendations*
- *Nighttime and daytime criteria*

OAAA

Model Ordinance Language

Mesa, AZ

ILLUMINATION RESTRICTIONS

- *All electronic variable message displays (EVMDs) shall comply with the following limitations on brightness:*
- ***EVMDs shall be equipped with a mechanism to control brightness through the means of an automatic dimming device or a scheduled dimming program, such that the brightness of the display (measured in candelas per square meter or nits), when measured in comparison with ambient lighting conditions (measured in lux)***

oaaa

Lessons Learned from the Field

- *Case study: Tulsa, OK*
- *Bill Hickman, Hickman and Fitzpatrick, PLLC*

oaaa

Lesson # 1: Public does not know what a digital billboard is

- *Public perception that digital billboards are TV screens – i.e., flashing, moving, blinking etc.*
- *Industry educated public on two fronts –*
- *(1) What it is*
- *(2) What it is not*
  - Presented video clips comparing digital billboards with other signs.
  - Presented OAAA DVD

oaaa

- *Industry initially did not educate and confronted opposition based on inaccurate assumptions that were made by the public*
- *Industry education also contained a press component*
- *Public education lead to greater acceptance*

oaaa

Lesson # 2: Put burden on opponents to prove digital billboards are not safe

- *Opponents said digital billboards were not safe – i.e., distracting to drivers*

oaaa

- *Industry supported safety position by presenting:*
  - Michel Tantala – expert
  - FHWA Memorandum – 9/25/07
  - OAAA data showing other states and cities allowing digital billboards
  - OAAA records showing safety studies conducted by state DOTs
  - Virginia Tech Safety Study
- *Policy makers made an informed decision that digital technology was not distracting*

oaaa

Lesson # 3: Be proactive when addressing the brightness issue

- *Opponents said digital billboards were excessively and dangerously bright*
- *Industry countered with facts –*
  - Daktronics expert presented engineering information – i.e., auto dim, effects of ambient light
  - Video comparisons
  - Arranged site visits to on-premise digital signs (and measured brightness levels of these signs)
  - Arranged site visit to digital billboard sites in nearby market

oaaa

- Industry initially did not present "pictures" or "views" which allowed the brightness, flashing issue to persist
- However, after many decision makers either saw a video comparison or an actual digital billboard, they were saying it was just as important that the signs not be too dim as too bright
- Issue was not whether digital billboards should be allowed, but, how regulated

OAAA

Lesson # 4: Accentuate the positives of digital billboards in a market

- *Opponents said the risks outweighed benefits*
- *Industry countered by highlighting the safety/security uses:*
  - AMBER alerts/emergency messages/crime
  - Congressional letters of support
  - Community leaders and safety officers (i.e., sheriffs)

oaaa

- *Economic and public opinion benefits*
  - Promotes economic growth
  - Supports non-profits
  - Arbitron study results – 81% digital billboards are helpful & beneficial
- *The presentation of these benefits of having the technology in the market pushed the industry over the top in achieving a workable ordinance*

OAAA

City of Tulsa ordinance

- 8 second dwell time and transition time of no more than 1 second
- 500 – 6,500 NITS brightness range
- Automatic ambient light adjustment feature required
- No story book advertising allowed – signs shall not display consecutive messages facing the same traveled way

oaaa

- 1,200 foot spacing on the same side of the roadway (same as traditional billboards) for initial period of 18 months then spacing increases to 1,200 foot spacing for digital signs facing the same traveled way (both sides of roadway)
- No mandatory public service provision
- The City of Tulsa ordinance represents a WIN-WIN for the outdoor industry and the citizens of the City of Tulsa

OAAA

ATTACHMENT "L1-L4"

Scenic America Position Statements

Scenic America
Change is inevitable. Ugliness is not.

For Immediate Release
Tuesday, October 2, 2007

Contact: Kevin Fry, President, Scenic America, 202.638.0550, ext 11, fry@scenic.org

U.S. Department of Transportation Caves in to Billboard Industry and Allows Potentially Dangerous Digital Signs to be Erected on Federal Highways

WASHINGTON, D.C. -- Ignoring the clear language of the Highway Beautification Act and its regulations, requirements for federal rulemaking, and its own promises to conduct highway safety research, the Federal Highway Administration (FHWA) of the U.S. Department of Transportation issued a "guidance memorandum" on Sept. 25 that will permit the construction of thousands of digital billboards along Interstate and federal-aid highways.

The "guidance" memorandum was issued without the opportunity for public comment or scrutiny by affected governments and communities, and dramatically alters the letter and spirit of the law while ignoring congressional intent and public opinion.

The policy was issued in spite of the fact that FHWA has agreed to conduct research into the safety issues associated with these controversial signs. That research will not be completed until 2009. The FHWA policy means that hundreds, if not thousands, of digital signs will go up along federal roads before it is determined if they are safe.

"This policy is backwards and extraordinarily irresponsible," said Kevin Fry, President of Scenic America. "Why is the federal government allowing a potentially dangerous device to go up without knowing if it poses a hazard to the American people? Obviously, there is some doubt about safety or the government wouldn't be spending money to study the issue. You'd think that given the problems the government already has with the safety of our infrastructure they wouldn't be looking for ways to add dangerous distractions to our overcrowded and congested highways."

Digital billboards generally take the form of large LED displays, which function like giant TV screens, and show advertisements that change intermittently every 4, 6, or 8 seconds. They are considered potential hazards due to their ability to distract motorists from the driving task in ways traditional billboards do not.

The signs are extraordinarily bright, especially at night, where they dominate the driver's field of vision and cause inadvertent and instinctual glances. Images change on a regular and intermittent basis, like a huge slide show in the sky. The constantly changing images cause many motorists to look at the signs long enough to see what comes up next in the rotation. And the messages on the signs take a minimum of five seconds to comprehend, according to the billboard industry itself.

A 2006 National Highway Traffic Safety Administration study showed that anything that distracts drivers for more than two seconds significantly increases the chances of accidents. The FHWA policy does not explain how the agency came to the conclusion that the unique characteristics of digital signs do not violate the two-second distraction threshold established by their own agency.

"I have yet to get an explanation from anyone about how a digital billboard can simultaneously be safe for drivers and be an effective advertising medium," said Fry. "The Federal Highway Administration has

completely abandoned the law, science, common sense, and public sentiment and told American motorists that their safety is secondary to the interests of the giant media companies that dominate outdoor advertising."

The new policy:

- Violates the Highway Beautification Act's prohibitions on changeable off-premise message signs along Interstate and federal-aid highways which were established by Congress in 1978.

- Violates the Highway Beautification Act's regulations prohibiting signs illuminated by "flashing or intermittent" lights, and ignores the accepted definition of "intermittent," a word which has been in common English usage for over five hundred years.

- Permits digital signs to go up along federal roads even though FHWA has not completed its research on the safety of electronic billboards, thereby allowing potentially dangerous devices to be erected without a full understanding of their effect on motorists.

- Ignores the results of research on driver distraction conducted by the National Highway Traffic Safety Administration, which showed that anything that distracts drivers for more than two seconds increases the chances of accidents, and makes no attempt to show that digital billboards do not cause distractions above and beyond the two-second threshold.

- Does not explain what will happen to digital billboards erected as a result of this policy if future research, including their own, shows the signs are a hazard to motorists, and presents no analysis of the costs to taxpayers of compensating billboard companies if studies show the signs to be dangerous and the signs must then be altered or removed.

- Allows transitions between changing images that can last up to four seconds, presumably in the form of dissolves or slow wipes that would almost certainly give the appearance of animation and motion, which is generally acknowledged to be dangerous by safety experts.

- Willfully and improperly subverts requirements for federal rulemaking in order to benefit a powerful special interest. By issuing this far-reaching policy as a "guidance memorandum," FHWA avoids public and stakeholder comment and media scrutiny, and prohibits interested parties, including local governments, from learning about the policy until it is too late to affect the outcome.

* * *

For a copy of the September 25 FHWA memorandum, go here.

For more details on the relationship of digital signs to the Highway Beautification Act, and the relevant language in the law and regulations, go here.

For a broad overview of the digital sign issue, download "Billboards in the Digital Age: Unsafe and Unsightly at Any Speed," here.

* * *

Scenic America is the only national nonprofit organization dedicated solely to preserving and enhancing the visual character of America's communities and countryside. Through national advocacy efforts and technical assistance services, local and national projects, and the support of its state affiliates, Scenic America fights to eliminate billboard blight; mitigate the impact of visual intrusions like cell phone towers and overhead power lines, while promoting scenic easements and other strategies to protect open space; preserve the visual qualities of public lands; protect the scenic character of the nation's highways and byways, and promote context-sensitive highway solutions; and build a national movement to preserve and defend America's irreplaceable scenic resources. For more information, visit www.scenic.org.

Scenic America

POSITION PAPER REGARDING THE PROPRIETY OF PERMITTING DIGITAL BILLBOARDS ON INTERSTATE AND FEDERAL-AID HIGHWAYS UNDER THE HIGHWAY BEAUTIFICATION ACT

State legislatures around the country are beginning to pass laws permitting the conversion of traditional static or tri-vision billboards to signs employing digital technology, generally in the form of electronic LED billboards. The outdoor advertising industry maintains that most states permit "changeable message signs," and therefore allow digital signs.

It is the position of Scenic America that this statement is inaccurate and unsupported. The Highway Beautification Act's unequivocal regulatory ban on flashing, intermittent, and changing lights is, per se, a ban on electronic signs. The Federal Highway Administration's 1996 policy permitting changeable message signs in the form of mechanical tri-vision signs was not blanket permission for electronic signs and cannot be used as a justification for allowing digital signs on federal-aid highways. Further, state legislative actions permitting these signs along Interstate or federal-aid highways are in violation of almost all existing federal-state agreements that govern implementation of the Highway Beautification Act (HBA).

The Act stipulates that states that do not adhere to the laws and regulations governing the application of the HBA are subject to penalties equal to ten percent of their federal highway funds.

* * *

Digital Billboards are "Intermittent" Lights, By Definition

Federal regulations and virtually all federal-state agreements ban billboards that employ "flashing, intermittent, or moving light or lights." This clear, long-standing policy is an explicit ban on current electronic display technologies, because all digital signs by definition employ intermittent lights, unless their images remain static, which virtually none do.

Digital billboards along Interstate and federal-aid highways are therefore impermissible.

Digital billboards, like other large LED displays, use as a "basic element . . . a trichromatic pixel that emits light of a required chromaticity using additive color mixing." [Source: Arturas Zukauskas, Introduction to Solid-State Lighting, 145 (2002)] When combined with other pixels, this process of additive color mixing allows for "1.0 to 68 million combinations of intensities, with millions of chromaticities and thousands of brightness levels possible." [Zukauskas, supra, at 145-46]

The change between displays occurs through the adjustment of individual green, blue, or red diodes within the thousands of pixels that make up such giant signs. [Source: "The Big Picture/Electronic Displays/Understanding Electronics/The Big Picture," downloaded from the website of YESCO.] Color changes are produced because variations in the color intensity of the red light, blue light, and green light provide a range of color intensity for the display itself. [Id. at 21.] For example, if a red light, blue light, and green light are all on at the same time it can generate a white light. If the blue light in a pixel were turned off but the green light and the red light remained on, the color yellow could be generated. Thus, if an array of

the three colors of diodes in a single pixel changed from white to yellow after eight seconds, the blue light could be expected to change **intermittently** from "on" to "off" in every sense of the term.

Webster's Ninth New Collegiate Dictionary defines "intermittent" as "coming and going at intervals: not continuous." That is a precise description of how LED signs work. At *intervals* set to four, six, or eight seconds, depending on state and local laws, the LED's recombine their colored diodes and *the images come and go.* The fact that there is never a blank screen or that the image isn't animated doesn't change the fact that the lights on the sign are non-continuous.

No policy that bans "intermittent" lights can legitimately permit the erection of digital signs.

That, in fact, is the basis of the federal policy prohibiting these signs and reflects the explicit intent of Congress, making any attempt to place digital signs along federal highways a violation of the law, both in letter and spirit.

* * *

Congressional Intent

In 1978, under pressure from the industry, Congress reviewed the question of how electronic signs should be treated under § 131(c), and adopted a compromise. **Congress amended the law only to allow additional latitude for electronic *on-premises* signs, while leaving off-premises electronic signs (such as electronic billboards) subject to the long-standing categorization of these signs as belonging to a forbidden class.** FHWA regulations state that "[n]o sign may be permitted which contains, includes, or is illuminated by any flashing, intermittent or moving light or lights," [23 C.F.R. § 750.108 (c)].

Before the adoption of the Surface Transportation Assistance Act of 1978 [Pub. L. No. 95-599, 92 Stat. 2689], a House Committee noted that "the Department of Transportation has characterized as a flashing light electronic information displays which neither flash nor animate static information, but where the only movement is the periodic changing of information against a solid, colorless background." [Pub. L. 95-599, Surface Transportation Assistance Act OF 1978, H. Rep. 95-1485, August 11, 1978. at U.S. Code Cong. and Admin. News 6593.] In responding to this classification, Congress amended Section 131 to allow the addition of electronic signs to one of the existing exemptions from the general ban – **but not for off-premises signs**. As the so-called Wachtel and Netherton Report noted two years later:

> Nothing in the 1978 amendments relating to CEVMS [commercial electronic variable message signs] changed the status of these signs when used in off-premises advertising, either as directional signs or as general outdoor advertising in zoned or unzoned commercial and industrial areas. The national standards for these forms of signage prohibited use of flashing, intermittent or moving lights, and moving or animated parts; **<u>and FWHA interpreted CEVMS as falling within the scope of these prohibitions.</u>**

[Source: *Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage*, June1980, Federal Highway Administration Offices of Research & Development Environmental Division] (emphasis in underlining and bold added)

The outdoor advertising industry's creation of networks of off-premises electronic devices strategically postured along federal interstate highways ignores this important Congressional compromise by installing off-premises electronic devices as if they were entitled to the special protections that Congress specifically provided only to electronic devices installed on on-premises signs.

* * *

Tri-Vision Signs are Not Digital Signs

In justification for its position, the outdoor advertising industry often points to a July 17, 1996, Memorandum from the Director of the Office of Real Estate Services of the Federal Highway Administration to Regional Administrators (attached) that altered existing policy (erroneously, in our view) to state that "certain off-premise changeable message signs are consistent with State law and do not violate the lighting provisions of their State/Federal agreement." This decision was specifically precipitated by the industry's desire to allow tri-vision signs on federal roads. Tri-vision signs use rotating slats to change images at regular intervals, the timing of which is governed by state law. They are not digital or internally illuminated signs.

The outdoor advertising industry often cites this memorandum involving **tri-vision signs** as justification for allowing states to permit **digital signs utilizing intermittent lights and utilizing a technology that gives the appearance of flashing,** without having to change the existing agreements. This, however, is a selective reading of the memorandum. The memorandum states, "Changeable message signs are acceptable for off-premise signs, regardless of the type of technology used, ***if the interpretation of the State/Federal agreement allows such signs. In nearly all States, these signs may still not contain flashing, intermittent, or moving lights.***" [Emphasis added]

The July 17, 1996, memorandum is clear in saying that in order for a state to allow tri-vision and other changeable message signs the federal-state agreement must be formally interpreted to permit them (a process even a decade later few have bothered to undertake). Although the states are given a lot of leeway by this memorandum, which we believe is excessive in its surrender of the federal interest in beautification, it is not a blank check. Even with tri-vision signs there must be a determination that the federal-state agreement permits them. It's not automatic.

But ultimately the determination the memorandum makes about tri-vision signs doesn't matter anyway. The sentence about the interpretation of the agreement is not the controlling one in the context of digital signs; it's the sentence that follows that truly matters: **signs with flashing and intermittent lights are still banned.**

Despite industry claims to the contrary, **the 1996 memorandum is irrelevant to the new debate about digital signs.** The irrelevancy is due to the clear prohibition on flashing and intermittent lights contained in the federal-state agreements and as spelled out in FHWA's own policies that were explicitly referenced in the memorandum.

* * *

Digital Signs Violate Federal-State Agreements

Although we believe that federal law and regulations, as they are currently written, prohibit digital billboards, any state that disagreed with that interpretation or that wished to adjust their agreement's ban on "flashing and intermittent lights," would need to explicitly amend their federal-state agreements.

To our knowledge, no state has followed the procedure, thereby placing those states with digital billboard legislation in potential violation of their federal-state agreement and subjecting them to the ten-percent penalty, assuming they are not limiting the signs to state or local roads not subject to HBA regulation.

States that have submitted opinions to the FHWA on the permissibility of tri-vision or other non-digital changeable message signs under their agreements and state laws, cannot automatically assume that the same principles carry over to digital signs. **Permission from FHWA to put up tri-vision signs is not the same as permission to put up digital signs.**

As the Federal Highway Administration's own web page entitled, *A History and Overview of the Federal Outdoor Advertising Control Program,* states:

> There is increased interest in several States to allow the erection of off-premise commercial electronic variable message signs (CEVMS). **We have historically considered that the prohibition of flashing, intermittent, or moving light or lights in most of the various State/Federal agreements applies to all off-premise CEVMS regardless of message interval.**
>
> In summary, in deciding whether to allow off-premise signs using rotating slats, glow cubes, or moving reflective disks, the applicable State law and agreement should be interpreted on an individual State basis looking at customary use, and if applicable, Court interpretations.
>
> **Off-premise message center type signs using internal lighting are not yet approved for general off-premise application.**
>
> [Emphasis added]
>
> [Source: *http://www.fhwa.dot.gov/REALESTATE/oacprog.htm#TERMS*]

In other words, according to FHWA, electronic signs are not permitted because they clearly fall within the definition of "flashing, intermittent, or moving light or lights." Although tri-vision signs may be permitted if they meet the definition of "customary use" under state law, digital signs are considered another class of sign and are prohibited. The rules on tri-vision signs **do not carry over** to digital billboards, and so any attempt to use the 1996 memorandum as justification for permitting them under the HBA is completely inappropriate.

Although states have the right to go through the process of amending their agreement, any attempt to remove the ban on "flashing or intermittent lights," or attempts to interpret that language as not applying to digital signs, should be rejected by FHWA as an improper attempt to avoid federal regulations and a violation of the requirement that states maintain "effective control" over outdoor advertising on federal-aid highways. FHWA can do this by merely restating existing policies and need not break any new ground to deal with this issue.

In fact, FHWA's position was clearly stated in a letter dated March 15, 2006, from Robert M. Callan, Acting Division Administrator for the FHWA Texas Division, to Timothy C. Anderson, of the Right of Way Division of the Texas Department of Transportation. The letter was in response to a query by the Texas DOT asking for guidance on whether LED billboards were allowed under their federal-state agreement. They were told they were not.

Clearly, the Texas principles should apply to any state whose federal-state agreement is similarly worded, which is to say almost all of them. After quoting the relevant standard language in Texas' agreement about "flashing, intermittent, or moving light or lights," the letter concludes that "While the technology for LED displays did not exist at the time of the agreement, the wording in the agreement clearly prohibits such signs." In other words, the part of the federal-state agreement that applies to digital signs is the one about flashing and intermittent lights, and none other. FHWA seems to maintain that digital signs are, by definition, a form of "flashing, intermittent, or moving lights," otherwise that provision presumably wouldn't have been used as justification for rejecting electronic billboards in Texas.

* * *

The Process for Amending Federal-State Agreements

According to the FHWA letter to the Texas DOT, the process of amending the agreement requires the following steps:

1. A State must first submit its proposed change, along with the reasons for the change and the effects of such change, to the FHWA Division Office.
2. The Division and FHWA headquarters offices review and comment on the proposal.
3. If the concept is approved by the FHWA, the State must hold statewide public hearings on the proposed change in order to receive comments from the public.
4. If the State then wishes to amend the agreement, it must submit to the FHWA: (a) The justification for the change; (b) The record of hearings and; (c) An assessment of the impact.
5. Then, these are summarized and published in the Federal Register for comments.
6. Comments on the proposed amended agreement will then be evaluated by the FHWA.
7. The FHWA will then decide if the agreement should be amended as proposed and will publish its decision in the Federal Register.

This process is extensive and requires major public participation precisely because changes to the agreements have significant ramifications both for communities and the federal interest in the beautification of the highways. The transformation of the very nature of billboards from static or mechanical devices to electronic signs is of great importance and cannot be undertaken without the kind of full public examination of the issue that is embodied in the process outlined above.

* * *

Why Digital Signs are Banned

It is important to understand what it is about signs with "flashing and intermittent lights" that puts them in a prohibited class. The distinguishing trait of intermittent light is that it can vary while a driver watches it, in a setting in which that variation is likely to attract the drivers' attention away from the roadway. Because that is the mischief at which the prohibition is directed, it makes no sense to conclude that the existing rule is inapplicable to new technology simply because it is new, or to have the meaning of the federal prohibition vary depending on whether other terms are present in the state-federal agreement. Thus, the industry's position violates both the purpose (as well as the intent) of existing federal law.

The underlying principle is simple: These signs, particularly those using modern display technologies, are prohibited because they pose potential hazards to the motoring public.*

* * *

The Law, Rules, Legislative History, And Administrative Record Are Quite Clear And The Conclusions Unequivocal

- Digital signs along Interstate and federal-aid highways are explicitly governed by the regulations prohibiting "flashing, intermittent, or moving light";
- Digital signs are not in the same class of changeable message sign as tri-vision signs and rules governing tri-vision signs do not apply;

- The clear intent of Congress was to continue the prohibition on off-premise electronic signs, even after the alterations in the law made in 1978;

- The 1996 memorandum regarding tri-vision and changeable message signs is not an implicit or explicit justification for permitting digital signs and in fact is an unequivocal restatement of policies prohibiting them;

- Even though the regulations currently prohibit digital signs, states seeking to permit them would need to attempt to formally amend their federal-state agreements with the Federal Highway Administration and follow the procedures outlined in the Texas letter;

- The FHWA should unequivocally reject any effort to amend federal-state agreements to permit digital signs due to their violation of the long-standing ban on flashing and intermittent lights, which is rooted in fundamental and unalterable principles of highway safety and beautification;

- States that have passed legislation permitting digital signs on Interstate and federal-aid highways are in violation of their federal-state agreements and are subject to a penalty of ten percent of their federal highway funds; and,

- The federal government should act quickly and unambiguously in this matter and should not surrender its regulatory authority to the states and permit individual states to interpret federal statutes and rules without constraint. States that have passed digital sign legislation should be notified that they are in violation of their agreement before large numbers of digital signs are erected on federal-aid highways, all of which would need to be deemed nonconforming.

Kevin E. Fry
President, Scenic America
1634 I Street, N.W., Suite 510
Washington, DC 20006
202.638.0550, ext. 11
fry@scenic.org

* For a fuller explanation of the safety issues inherent in these signs, see Scenic America's 2007 publication, *Billboards in the Digital Age: Unsafe and Unsightly at Any Speed*, available at www.scenic.org.

Exhibits:
Memorandum, July 17, 1996, from the Director, Office of Real Estate Services, Federal Highway Administration, to Regional Administrators re: Off-Premise Changeable Message Signs

Letter, March 15, 2006, from Robert M. Callan, Acting Division Administrator, Federal Highway Administration, to Timothy C. Anderson, Right of Way Division, Texas Department of Transportation

07/05/07

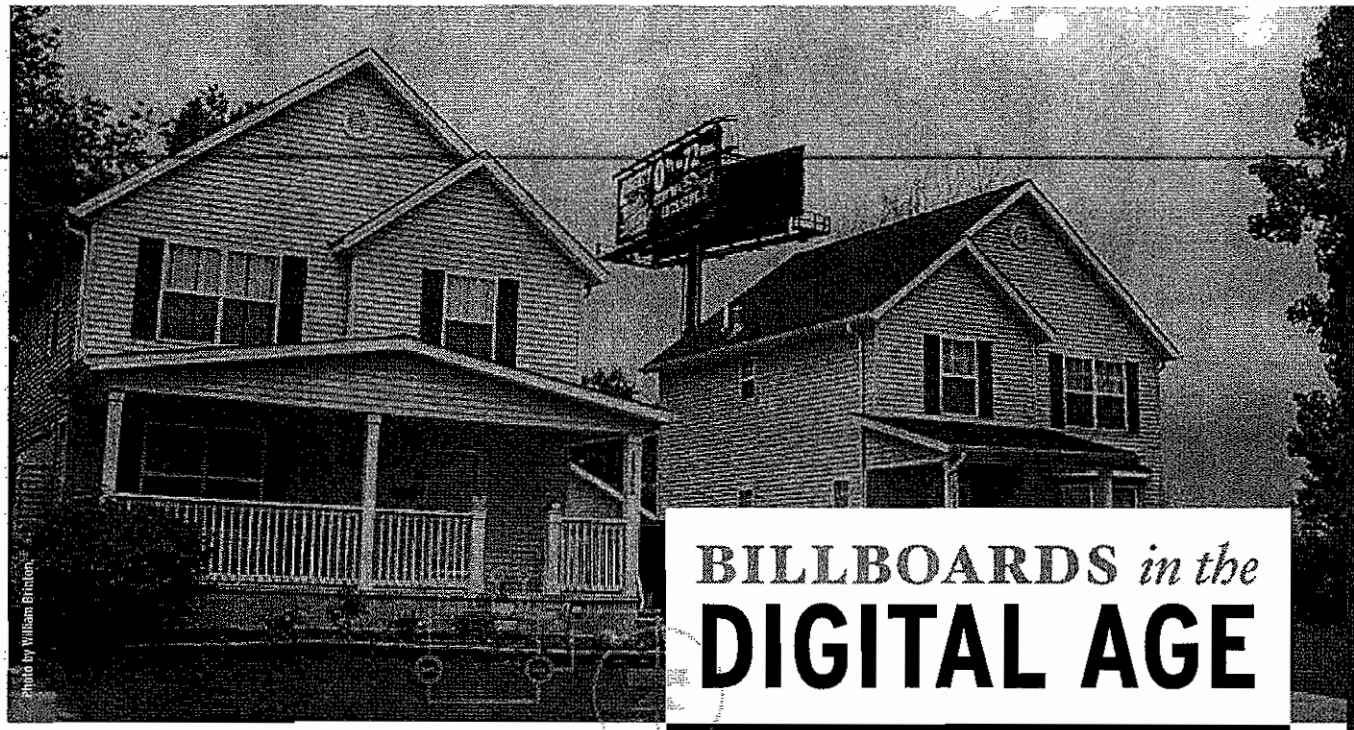


Photo by William Brinton

BILLBOARDS *in the* DIGITAL AGE

UNSAFE (AND UNSIGHTLY) AT ANY SPEED

IMAGINE DRIVING along a twisting, two-lane Alabama road at night. As you slow for a curve, suddenly an enormous television screen pops into your field of vision, temporarily blinding you before flashing an ad for an insurance company.

The glaring lights of this particular sign, slapped up in suburban Vestavia Hills, blindsided city zoning officials as well. They had unknowingly given entrée to digital billboard technology when they approved what appeared to be a routine application to add lighting to a sign grandfathered in years ago. The application made no mention of changeable messages and gave no indication it would transform an old, static board into a giant vehicle for digital TV-like images.

Police officers immediately complained the board posed a major safety hazard. Neighbors complained about the glaring lights. Lamar Advertising Company, which owns the board, claimed they'd made the changes in "good faith."

Anyone who has been following the digital-billboard movement may recognize that argument as a popular tactic employed by an industry that finds it easier to ask localities for forgiveness than permission. It's one of many strategies being used to bring digital technology to as many cities and towns as possible, before localities have a chance to explore the implications of the new technology, update their sign ordinances, or ban digital signs outright.

"There's a full-court press going on at the national, state, and local level, being waged by Lamar, Clear Channel, and CBS Outdoor," said Bill Brinton, an attorney specializing in sign law and a member of the board of Scenic America. Lobbyists are pushing state legislators to pass bills that clear the way for LED (light-emitting diode) signs on state and federal roads, and the industry is pressuring state departments of transportation to rewrite regulations to allow them to transform static signs into digital boards. And in cities and counties across America, they are pressing for looser sign ordinances or simply installing the new technology without permission to do so.

> *"For in-your-face results that won't end in a restraining order, out-of-home is the only way to go."*
>
> www.lamaroutdoor.com

Digital signs are far more of a threat than their predecessors, said Kevin Fry, president of Scenic America. They're brighter, which makes them visible from far greater distances; they're much more distracting, because of their brightness and because the messages are constantly changing; they're often taller than regular boards, giving the appearance of large, plasma-screen TVs; and they're substantially more expensive to remove, so localities without amortization laws could find themselves unable to afford taking them down. This would be especially true for signs along federal-aid highways where the use of amortization is prohibited by the Highway Beautification Act.

Despite higher installation costs, the profitability of digital boards provides a powerful incentive for companies to put up as many as possible. Clear Channel Outdoor spent $3.5 million converting seven static boards to digital in Cleveland, but watched revenue jump from $300,000 to $3 million in the network's first year, according to Mark P. Mays, Clear Channel's CEO.

That's because digital boards allow companies to sell ad space to 10 times as many clients as static ones; most signs change messages every six seconds. They also allow advertisers to change content several times a day or week, and unlike the static boards, which require contractors to change messages manually, digital boards allow operators to change content from remote locations in a matter of seconds, with just a click of a mouse.

Lamar Advertising boasts that it has digital billboards in as many as 44 states. Clear Channel, the world's largest outdoor advertising company, is similarly upfront about its goals for spreading digital technology. In a November 2006 press release announcing the launch of multi-sign digital networks in Milwaukee and Tampa, Clear Channel Outdoor Global President Paul Meyer put it bluntly:

"New digital technologies provide us with the capability to execute both general market and targeted advertising campaigns that ***consumers can't mute, fast forward or erase,***" he said. [Emphasis added.]

When digital comes to town, local governments are often caught off guard. As was the case in Vestavia Hills, billboard owners are not always upfront about what they are doing, and the technology may be installed without notice.

But in a rare victory for billboard opponents, the Vestavia Hills Board of Zoning Adjustment (BZA) ordered Lamar to turn off the lights and shut its board down—at least until they could hold a hearing for a zoning variance. The board ruled that the switch had been made under "false pretenses." Had Lamar asked for permission to add digital animation, the board likely would have said no, particularly for that location, zoning officials said. *In fact, Vestavia Hills' new sign ordinance, which was under consideration at the time, would outlaw this kind of sign entirely. The BZA later denied the variance request, and the billboard company filed a lawsuit which is now in the county court system. In the meantime, the digital board has been covered with a traditional sign. A permit request to install a digital face on the other side of the sign was denied.*

City officials in several Minnesota communities were likewise surprised last year when digital billboards began to appear on Clear Channel and Lamar sign structures. In most cases, the companies that leased the signs had sought building permits only to upgrade them, omitting from their applications any indication they planned to hang digital displays on those structures after the upgrades. Their chosen locations included communities with some of the strongest billboard prohibitions.

Clear Channel's strategy backfired, especially in Minnetonka, which for more than 41 years has carried a prohibition on illuminated signs that change in color or intensity. The city pulled the plug on the signs, issued stop-work orders, and then defeated an effort by Clear Channel to obtain an injunction. As Judge Lloyd Zimmerman later found, "there is substantial evidence to support Minnetonka's claim that Clear Channel avoided disclosing its plans to deploy LED billboards in the City of Minnetonka, and operated 'under the radar' in order to get the billboards up and running, in order to meet its expansion and profit goals for 2006."

Meanwhile, one Minnesota community after another has adopted a moratorium on digital display devices to temporarily protect themselves against a repeat of the companies' subterfuge.

It's not unusual for billboard operators to erect digital signs even when State-Federal agreements or local ordinances prohibit them, knowing that local enforcement can be difficult due to lax or inefficient enforcement or the prospect of the lengthy and costly litigation that inevitably follows.

The Texas Department of Transportation's State-Federal agreement clearly prohibits digital billboards. In fact, when state transportation officials requested clarification from the Federal Highway Administration (FHWA) to see if they could allow the boards, they were told in no uncertain terms they could not.

"While the technology for LED displays did not exist at the time of the agreement, the wording in the agreement clearly prohibits such signs," the FHWA wrote to Texas transportation officials in a letter dated March 15, 2006.

Nonetheless, LED signs have gone up in several cities around the state. And in a recent media interview, Clear Channel Communications CEO Mark Mays made it clear his company had big plans for Texas, particularly San Antonio.

"The question becomes how big an opportunity it will be over the next 10 years," he said. "Is it going to be half the signs in San Antonio, is it going to be a quarter of the signs in San Antonio or is it going to be 10 percent?"

"If Texas is going to allow this, the public should be involved," said Margaret Lloyd, policy director for Scenic Texas. "In my judgment, we need at least three things: first, a safety study funded by a neutral, objective party; second, a cost study to determine the taxpayer burden if these signs have to be condemned for highway widenings; and finally, a public opinion survey to determine if citizens want these signs to be erected along their publicly funded highways."

Photo by Leighton Powell.

One state where the industry hasn't been successful in getting what it wants is Kentucky, where state transportation regulations prohibit both Tri-Vision and LED signs.

Tom Fitzgerald, director of the Kentucky Resources Council, said the outdoor advertising industry has tried on several occasions to push through legislation that would allow them to add the new technology, but lawmakers in the House have stood firmly against it. They came closest in 2004, when the industry had someone insert language allowing Tri-Vision signs into a bill that focused on tree-cutting around billboards.

"That bill got through the Senate and into the House before people realized the provision was even in there," Fitzgerald said. But the House leadership killed the bill, as it has done to tree-cutting bills consistently over the years. This year, a bill that would have allowed electronic billboards and Tri-Vision signs was introduced but died in committee.

"We've not really had a toe-to-toe fight on electronic billboards yet," Fitzgerald said. "I believe there are strong public safety issues at stake."

For many outraged citizens, traditional concerns about "litter on a stick," have now been supplanted by the prospect of confronting "PowerPoint on a stick" along their communities' roadways. The advent of digital technology has opened a new front in the battle against blight—with more at stake than ever before.

ARE THEY SAFE?

The billboard industry often tries to win support for its signs by offering to display public service messages. But no amount of these inducements can compensate for the potential public safety consequences of these devices.

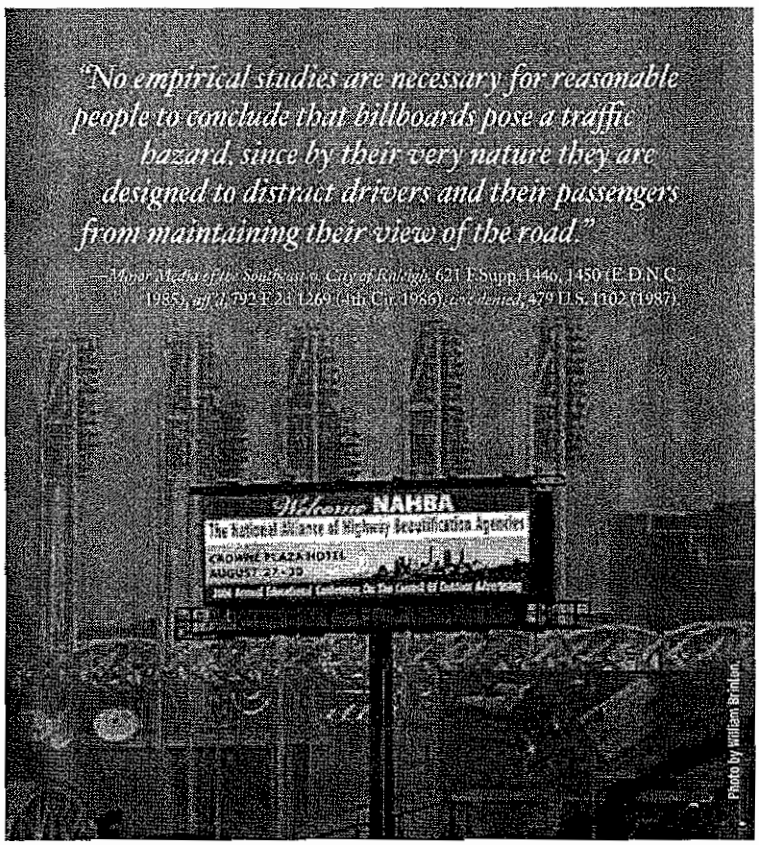
BILLBOARDS ARE ADVERTISEMENTS. They are designed to grab our attention, and hold it, just like a television or radio commercial or an ad in a magazine. The latest in billboard technology—the digital or electronic sign—tries to hold our attention even longer by changing messages and pictures every few seconds using a series of extremely bright, colorful images produced mainly via LED (light-emitting diode) technologies.

Common sense tells us that if we are looking at a billboard and not at the road when we are driving, that's a dangerous thing. Brightly lit signs that change messages every few seconds compel us to notice them, much the same way our eyes move to the television screen when it's on. They lure our attention away from what's happening on the road and onto the sign. It's just human nature. And it works. That's why these signs are so incredibly lucrative for the billboard industry.

Proponents of digital billboards say nobody has ever proven that they increase traffic accidents. This statement is only partially true. Some studies have shown a link between digital billboards (as well as static boards) and traffic safety problems, while others remained inconclusive. ***Importantly, no objective studies have shown them to be safe, nor have studies been conducted since these signs have started to proliferate.***

What does the research currently say?

- A Wisconsin Department of Transportation study conducted in the 1980s examined crash rates on I-94 East and West adjacent to the Milwaukee County stadium, after a variable message sign that showed sports scores and ads had been installed. The study found that ***sideswipe and rear-end collisions were up as much as 35 percent where the sign was most visible.***



"No empirical studies are necessary for reasonable people to conclude that billboards pose a traffic hazard, since by their very nature they are designed to distract drivers and their passengers from maintaining their view of the road."

—*Moore Media of the Southeast v. City of Raleigh*, 621 F.Supp.1446, 1450 (E.D.N.C. 1985), *aff'd*, 792 F.2d 1069 (4th Cir. 1986), *cert. denied*, 479 U.S. 1102 (1987).

Photo by William Brinton

THE TWO SECOND RULE: What Every Community Should Know

An analysis of the *100-Car Naturalistic Driving Study*, conducted by the National Highway Traffic Safety Administration, released in 2006, *showed that taking one's eyes off the road for more than two seconds for any reason not directly related to driving (such as checking the rear view mirror) "significantly increased individual near-crash/crash risk."*

Are electronic signs especially attention-getting?

"Nothing's as eye-catching as an electronic LED display. The brightly-lit text and graphics can be seen from hundreds of feet away, ***drawing the attention of everyone within view."***

Source: Voiceover narration of Trans-Lux promotional video (www.impactmovie.com/trans-lux)

What factors make drivers likely to look at an electronic sign for more than two seconds at a time, and therefore put themselves and others at risk?

- They are extremely bright and are designed to be visible in bright sunlight and at night. The eye is drawn to them far more strongly than to traditional illuminated billboards. They are designed to be eye-catching, and they are.
- They can be seen from great distances, even as far away as six-tenths of a mile, making them distracting even before they begin to communicate their messages.
- The images rotate every 6–10 seconds and drivers will naturally look at the sign long enough to see what comes up next. There may be as many as 10 messages in the rotation.
- The Florida Department of Transportation's official position is that it takes a minimum of six seconds to comprehend the message on an electronic billboard, which is already three times the safe period for driver distraction.

Will people stare at a changing sign to see what's next?

"The reason [electronic] advertising works is because it is impactful. If you see people parked at the stoplight watching it, ***you see their eyes waiting for it to change."***

Source: Clear Channel Outdoor Des Moines division president Tim Jameson, quoted in the *Des Moines Business Record*, Feb. 4, 2007

- Because the messages change daily or even hourly, even commuters who pass by the signs every day will look to see what's new. Traditional signs become visual background noise for local drivers, and thus have less safety impact; but electronic signs never blend into the background.
- Younger drivers may be more easily distracted by electronic media, and older drivers may require longer viewing times to comprehend often confusing, elaborate, and colorful images.

See Additional Resources on the back page for links to the studies referenced above.

- A 1998 FHWA memo noted that digital signs raise ***"significant highway safety questions because of the potential to be extremely bright, rapidly changing, and distracting to motorists."***
- A 2001 FHWA review of billboard safety studies found that ***"the safety consequences of distraction from the driving task can be profound."***
- A 2003 report titled External-To-Vehicle Driver Distraction, by the Development Department Research Programme in Scotland, found that "there is overwhelming evidence that advertisements and ***signs placed near junctions can function as distracters, and that this constitutes a major threat to road safety.***" It further noted that, "Young (aged 17–21) drivers are particularly prone to external-to-vehicle driver distraction."

If other studies have remained inconclusive, there is good reason, researchers say. First, many of the studies have been funded, and directed, by the billboard industry (see sidebar). Second, there are inherent difficulties in conducting traffic safety research.

Jerry Wachtel, an engineering psychologist with 25 years of experience in the field of driver behavior, said too many variables contribute to traffic accidents to make it possible to prove causality from a single source. "Most accidents are not caused by one thing, but multiple things happening at once," he said.

According to Wachtel, digital billboards undoubtedly contribute to the growing number of distractions that vie for a driver's attention today. Cell phones, navigational systems, and DVD players constitute in-car distractions, while billboards, especially those that change messages, constitute external distractions. Both, he said, contribute to traffic safety hazards that he believes are growing increasingly worse.

"The outdoor advertising industry in my opinion is one part of the problem, but a significant part," he said.

Wachtel co-authored a report for the Federal Highway Administration back in the 1980s, updated in 2001, which concluded that "some studies showed a clear relationship between the presence of outdoor signs and driver error or accidents and other studies hadn't shown anything." It recommended government-funded research into the issue, but the research was never funded.

The Federal Highway Administration in January 2007, however, announced that it will initiate a study to examine the safety issues related to electronic signs. Details on the scope and timing of the research have not been released, but results are not expected until 2009.

Court Rules Virginia Tech Billboard Safety Study Lacks Credibility

To overcome the argument that billboards are a distraction to drivers, the outdoor advertising industry often points to a study it says "definitively" shows the signs create no safety risks whatsoever. This study, conducted by Dr. Suzanne Lee of the Virginia Tech Transportation Institute, often pops up in outdoor advertising litigation, or may be given to lawmakers in hopes of persuading them of the supposed safety of highway signs.

This study is not only inherently flawed and biased; its uselessness was noted by a federal district court judge in New York. In *Nichols Media Group v. The Towns of Babylon and Islip*, the court held that ***"the Lee Study is so infected by industry bias as to lack credibility and reliability."*** It based its opinion on several factors:

- "The study was ***funded by the Foundation for Outdoor Advertising Research and Education, a close affiliate of the Outdoor Advertising Association of America.***"
- "Trial ***testimony revealed that representatives of the OAAA were intimately involved in the design and conduct of the Lee Study.***"
- "The Lee Study has been neither widely disseminated nor subject to peer review. ***Nor have the conclusions of the Lee Study been replicated in any other study.***"

Don't let industry lobbyists use this discredited study as "proof" that billboards are safe. The only thing it proves is how much money the billboard industry is willing to spend making bogus arguments.

Digital signs are often the brightest objects in the landscape, especially at night. They dominate the field of view and offer dangerous distractions for the traveling public.

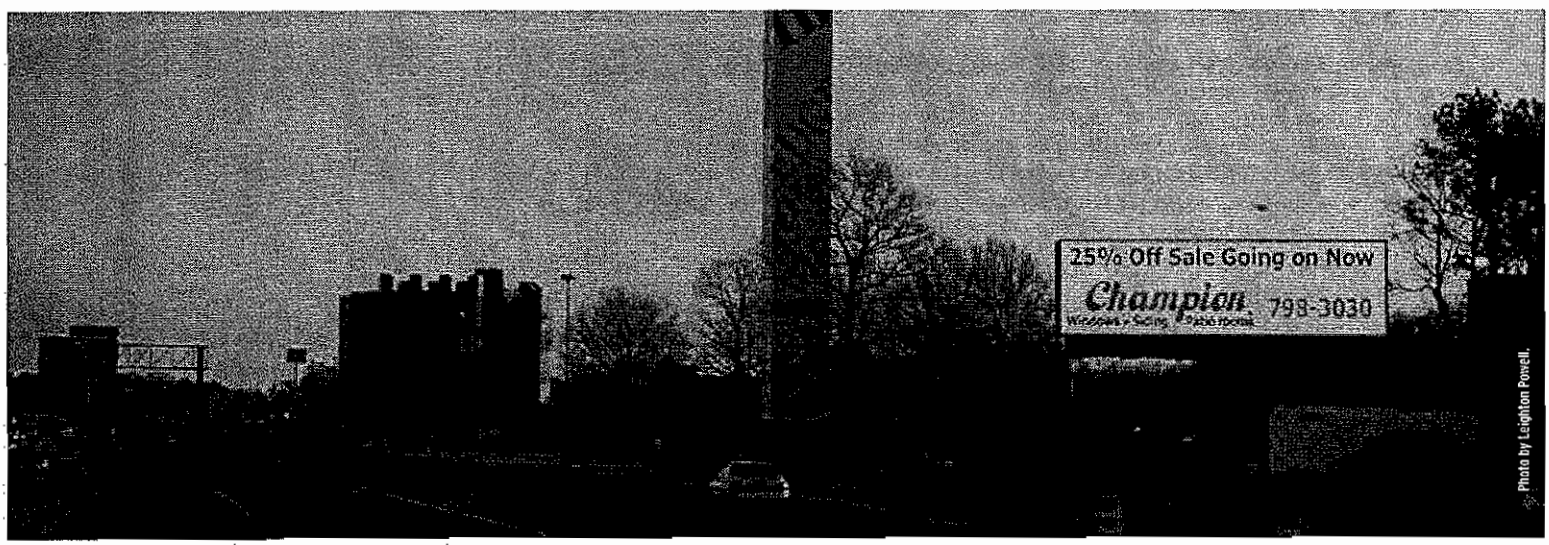


Photo by Leighton Powell.

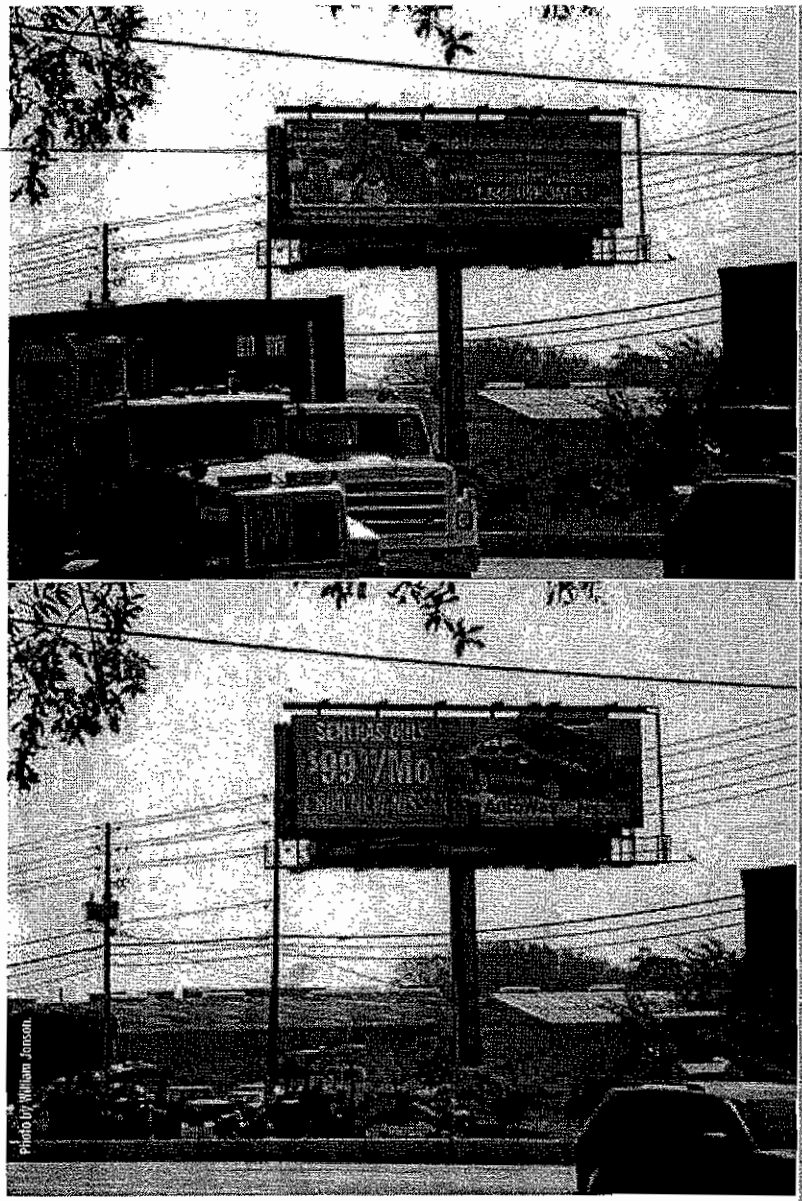


Photo by William Jonson.

Bright electronic signs with complex, changing messages contribute extra distractions to motorists already confronted by visually cluttered environments. How long would it take you to comprehend the messages on this sign? More than two seconds?

A Word of Caution for Local and State Governments

Local and state governments should be wary of approving electronic signs, pending the outcome of definitive objective studies regarding their safety. If research proves these signs to be unsafe, governments could face significant liability and negligence issues if accidents occur in the vicinity of the signs. Additionally, if the signs must later be removed because they are deemed a hazard, the cost of compensating sign owners would be enormous, particularly along federal-aid highways where the Highway Beautification Act requires cash compensation and prohibits compensation via amortization.

There is no objective evidence that these signs are safe. **To protect themselves from potentially catastrophic costs in the future, governments at all levels should enact immediate moratoriums on these signs until it is known for sure whether or not they pose a hazard to the motoring public.**

TALKING POINTS

Studies show drivers who take their eyes off the road for more than two seconds are far more likely to suffer a crash or near crash. Digital billboards often attract drivers' attention for more than two seconds because they are extremely bright and colorful and employ messages that change frequently.

Most images change every six seconds because that's how long it takes to comprehend the message. That's also three times longer than it takes to cause an accident. Motorists stay focused on the sign to see what's next. Many signs have up to 10 different messages in rotation.

Commuters can learn to tune out traditional boards because the message doesn't change. But digital signs change messages frequently, creating fresh, daily distractions. Young and elderly drivers are particularly susceptible to distractions, making these signs especially problematic for drivers already at higher risk.

Local and state governments should enact moratoriums on digital signs until definitive safety research is concluded. Severe liability issues could ensue if governments approve signs that are later proven to be unsafe. The costs of buying out those signs would be enormous.

Many state agreements with the Federal Highway Administration prohibit digital billboards but are not being enforced or are being interpreted to favor the new signs. The FHWA declared in 1996 that if a state agreement bans boards that contain "flashing, intermittent, or moving lights," it effectively bans digital billboards.

Banning digital billboards does not violate the First Amendment right to free speech. Most local jurisdictions have the right to enact strict bans on digital signs in spite of state rules that may permit them.

Digital billboards can often be seen from more than a half-mile away, uselessly and adversely affecting visual quality long before the viewer is close enough to read the sign. This violates the spirit of requirements regarding the spacing of signs along the highway.

State and local governments should reevaluate their rules related to on-premise signs, which often permit electronic signs using highly distracting full-motion video, in spite of being located adjacent to highways. On- and off-premise electronic signs should not be regulated differently when safety is at issue.

Donated ad space and Amber Alerts cannot compensate for the threat to public safety or the aesthetic harm done by digital signs. Alternatives exist for emergency communication along highways.

ARE THEY LEGAL?

THE FIRST STEP in fighting a digital billboard that has been erected or proposed in your locality is to find out whether your state's agreement with the Federal Highway Administration (FHWA) already prohibits them. Many do. While that hasn't stopped the billboard industry from erecting the signs anyway, it can give you some powerful ammunition with which to challenge them and argue for their removal.

Flashing, Intermittent, or Moving Lights

On July 17, 1996, the FHWA issued a memorandum clarifying the status of "changeable message signs." It noted that many State-Federal agreements would allow for changeable messages such as the Tri-Vision signs that use rotating panels or slats. However, it also noted that, even if Tri-Vision signs were allowed, the agreement probably wouldn't allow LED signs. "In nearly all States, these signs may still not contain flashing, intermittent, or moving lights," the memo states.

A 2006 letter to Texas Department of Transportation officials goes even further. If the state agreement prohibits signs "illuminated by any *flashing, intermittent or moving light* or lights...including any type of screen using animated or scrolling displays, such as LED (light-emitting diode) screen or any other type of video display, *even if the message is stationary*," then "the wording in the agreement clearly prohibits such signs," it states.

Nonconforming Signs

Another industry trick is to convert a static, nonconforming sign to an LED sign and claim that the change is not an "improvement," and therefore not prohibited. The 1996 FHWA memo clearly states that this is not permitted, as "applying updated technology to nonconforming signs would be considered a substantial change and inconsistent" with federal regulations.

A July 1998 FHWA memo offers further guidance. It declares that signs with animation or scrolling messages should be considered nonconforming signs and notes that they raise "significant highway safety questions because of the potential to be extremely bright, rapidly changing, and distracting to motorists."

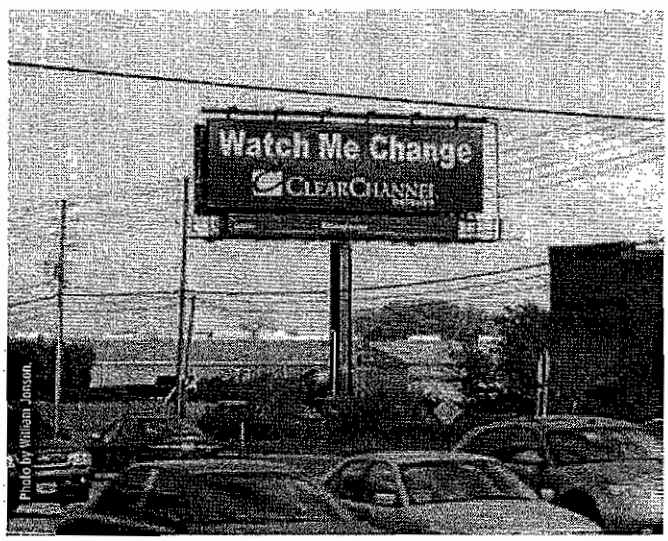


Photo by William Jonson.

Additionally, nonconforming signs on state or local roads not covered by the Highway Beautification Act are often governed by local ordinances that do not allow them to be substantially altered or expanded either. Local jurisdictions have denied permits for conversion to digital technology, although some of those denials have been challenged.

Local cities, towns or counties may usually impose stricter regulations on outdoor advertising than the state or federal government does.

Can Local Governments Prohibit Signs Allowed in State-Federal Agreements?

Yes, in almost all states. Local cities, towns or counties may usually impose stricter regulations on outdoor advertising than the state or federal government does. The State-Federal agreements govern signs on interstate and federal-aid highways. Localities may also create stricter standards for state and local roads.

The First Amendment

Often, billboard industry representatives try to convince local governments that if they ban billboards, they will be violating the First Amendment right to free speech. ***This is not true.***

In almost all states, localities may ban billboards outright, or may restrict the size and types of billboards that are allowed. The only thing they cannot restrict is what they say.

"It's only when you get into banning content that you get into trouble," said Eric Kelly, an attorney and professor of urban planning at Ball State University, who often helps local cities and towns draft or revise their sign ordinances.

Kelly recommends that local governments also make any rules regarding sign technology consistent between on-premise and off-premise signs to avoid potential litigation that might charge they are giving preferential treatment to one type of business over another. But that doesn't mean that you have to allow digital billboards if you allow banks to show the time and temperature, or gas stations to regularly change the prices posted on their signs, he said.

Allowing signs to change messages no more than once per minute, or restricting the size of the sign to no more than 30 square feet, allows for time and temperature signs, gas stations and church message boards but essentially bans Tri-Vision billboards and digital message boards that show new ads every six or eight seconds.

It also helps, said Kelly, to include language in the ordinance explaining why the restrictions are there. If the ordinance states that its mission is to promote safety and aesthetics, and ties this goal back to goals in the local comprehensive plan, it strengthens the ordinance and helps protect it from legal challenges.

Follow this sign's instructions and you may regret it. By taking extra seconds to watch the sign change (and change and change), drivers place themselves and others in potential danger.

WARNING SIGNS: Industry Tactics to Watch Out For

Billboard owners often lament on industry websites that current regulations and public sentiment present their biggest hurdles to mass deployment of digital signs. But in addition to the industry's normal political influence, it frequently employs some common strategies with local officials for overcoming those roadblocks. Here is what your community can expect to encounter if permission is sought for electronic signs:

Amber Alerts and Other Public Service Announcements

When Clear Channel installed a network of 10 digital billboards in Albuquerque, part of its deal with the state was that it would run Amber Alerts and other emergency messages for free. It made the same deal in Cleveland. "Strategic relationships with the community are important," a company representative told the *Albuquerque Tribune*.

But many cities and states don't need digital billboards to run Amber Alerts. Existing government-operated digital highway signs, which have been in place for many years, as well as television and radio, already provide a system for emergency communication.

Nonprofits and police departments should not allow themselves to be used as justification for the visual degradation of their community. No amount of donated ad space or Amber Alerts can compensate for the aesthetic and safety damage done by these signs.

Let's Trade

To erect seven digital billboards on highways entering Cleveland, Clear Channel took down several hundred billboards elsewhere in the city.

This might look like a good deal, but the truth is most of the boards taken down in these swaps are nonconforming or unprofitable signs anyway. Billboard companies are willing to make the swap because the digital boards are so much more profitable, and because they would otherwise be unable to erect them, since many localities have limitations on erecting new boards. And once the digital signs go up, they become cost-prohibitive to remove should the government later need to buy them out due to road improvements, commercial development, or if the signs are proven to be hazardous.

Governments should not fall for offers to take down old signs in exchange for permitting new digital ones. Whatever perceived benefits accrue from such deals don't outweigh the introduction of devices that will potentially lead to traffic deaths and injuries and degrade the visual character of the community. Further, in the absence of a complete moratorium on new signs, the old signs will inevitably be replaced somewhere within the jurisdiction.

When an Improvement is Not an Improvement

These days, governments should be wary of seemingly innocuous applications to "improve" old signs or "add or upgrade lighting," which may hide a plan by a sign company to replace a static billboard with a digital sign. Installing digital technology over a regular board is not an update or "improvement," but should be treated as construction of an entirely new sign.

Some sign companies, in their eagerness to convert their signs, simply ignore rules and regulations and make changes without permission, hoping to intimidate local governments with the prospect of long and expensive legal battles or counting on a lack of political will to enforce the law.

What Does the Public Think?

Billboard companies often claim that digital signs are very popular with the public, but never cite data to back up the claim. Perhaps that's because research shows the opposite.

A 2005 survey conducted in Arizona found that by a margin of 73 percent to 21 percent, citizens opposed laws that would allow electronic billboards on the state's highways. When the 21 percent favoring digital signs were then asked if they would still support the signs if they "might distract drivers," the opposition to electronic signs grew to 88 percent.

The survey of 682 adults had a statistical precision of plus or minus 3.8 percent.

DON'T TAKE OUR WORD FOR IT...

How Big is the Issue?

Electronics industry analyst, iSuppli, "predicts that by 2010, 75,000, or 15 percent of total billboards in the U.S., will be digital displays, up from a mere 500 digital billboards, or 0.1 percent, of all billboards in 2006."

Source: "Channel Viewpoint: Consumer electronics—just the sideshow to the advertising at CES," *eChannelLine Daily News*, January 9, 2007

What's Bad for You is Good for Them

"Nobody likes being stuck in a traffic jam, but Clear Channel executives are coming to love them. 'Hey, traffic is a good thing,' quips Clear Channel Communications Inc. CEO Mark Mays. 'People listen to more radio, and they have more time to look at billboards.' Now that's a captive audience."

Source: *Business Week Online*, June 20, 2005

And You Thought You'd Never Get that Big-Screen TV

"As one drives along Hwy. 101 between San Jose and San Francisco, there are many billboards that vie for your attention. But just as you near San Carlos, it is tough if not impossible to miss one particular two-sided billboard.... Its excellent positioning allows it to be seen by traffic as far as one kilometer from either side.... But then you couldn't miss a 34 ft. x 19 ft. Hi Definition TV on the side of the road that stands almost 40 feet above the ground, could you? And that's exactly what SiliconView's LED billboard looks like, a giant TV."

Source: *Outdoor Today*, January 2005

If You Build It, They Will Stare... for More Than Two Seconds

"[Electronic] Billboard scheduling is based on a 'repeating loop' of advertising messages. The SiliconView loop contains six different messages, each displayed for five seconds with a one-second pause between each message. Thus, one message loop lasts approximately 36 seconds. The loop continuously repeats on a 24-hour basis, which gives each advertiser at least 2,880 viewing exposures per day.... A factor that determines dwell time, or the amount of time a commuter sees a billboard, is the vehicle's speed approaching the board. ***At 65 mph, a Highway 101 driver sees one full rotation of the SiliconView billboard. During peak hours, when traffic slows, a driver could see three to five loops.***" [emphasis added]

Source: "Pixels and Prints: Outdoor's Future Fusion," *Signs of the Times*, August 2003

ADDITIONAL RESOURCES

A definitive study on the safety of electronic billboards has yet to be done, but the following documents contain information that is important to the current debate. The research papers referenced below are available as PDF files at the Scenic America website at **www.scenic.org/billboards/electronic**. *You will need to have the Adobe Acrobat Reader on your computer to read them.*

The Impact of Driver Inattention on Near-Crash/ Crash Risk: An Analysis Using the 100-Car Naturalistic Driving Study Data

April 2006, National Highway Traffic Safety Administration, U.S. Department of Transportation

A major study of driver inattention, primarily involving distractions inside the car, but finding that any distraction of more than two seconds is a potential cause of crashes and near crashes.

Traffic Safety Evaluation of Video Advertising Signs

Transportation Research Record: Journal of the Transportation Research Board, *No. 1937, 2005*

A study of electronic signs in Toronto, which finds that "On the basis of the eye fixation study and the pubic survey data, it is apparent that video advertising can distract drivers inappropriately and lead to individual crashes," but calls for additional research due to other conflicting data.

Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction

September 11, 2001, Federal Highway Administration, U.S. Department of Transportation

A summary of existing research (as of 2001), on the subject of the safety of electronic signs and a call for additional studies.

Milwaukee County Stadium Variable Message Sign Study: Impacts of an Advertising Variable Message Sign on Freeway Traffic

December 1994, Wisconsin Department of Transportation

Study of the dangers posed by an electronic sign in Milwaukee along I-94, that concluded that "It is obvious that the variable message sign has had an effect on traffic, most notably in the increase of the side swipe crash rate."

BE SURE TO VISIT THE SCENIC AMERICA WEBSITE AT **WWW.SCENIC.ORG** FOR ADDITIONAL AND UPDATED INFORMATION ABOUT THIS AND OTHER SIGN CONTROL ISSUES.

Photo by Suzanne Hardin

Scenic America
1634 I Street, N.W.
Suite 510
Washington, DC 20006

202.638.0550
202.638.3171 (fax)

For additional information about this and other issues, visit **www.scenic.org**.

Kevin E. Fry, *President, Scenic America*
Laura Williamson McCafferty, *Writer*
Kristen Argenio, *Ideal Design Co., Designer*

This publication was funded in part by the Richard King Mellon Foundation.

Scenic America is the only national nonprofit organization dedicated solely to preserving and enhancing the scenic character of America's communities and countryside. Through national advocacy efforts and technical assistance services, local and national projects, and the support of its 11 state affiliates, Scenic America fights to reduce billboard blight and other forms of visual pollution; preserve the scenic character of the nation's highways and byways; promote context-sensitive highway solutions; ensure the mitigation of the visual impact of cell phone towers and other intrusions in the landscape; and promote scenic easements and other strategies to protect open space and preserve irreplaceable scenic resources.

Change is inevitable. Ugliness is not.

© Copyright 2007 Scenic America

Digital Billboards

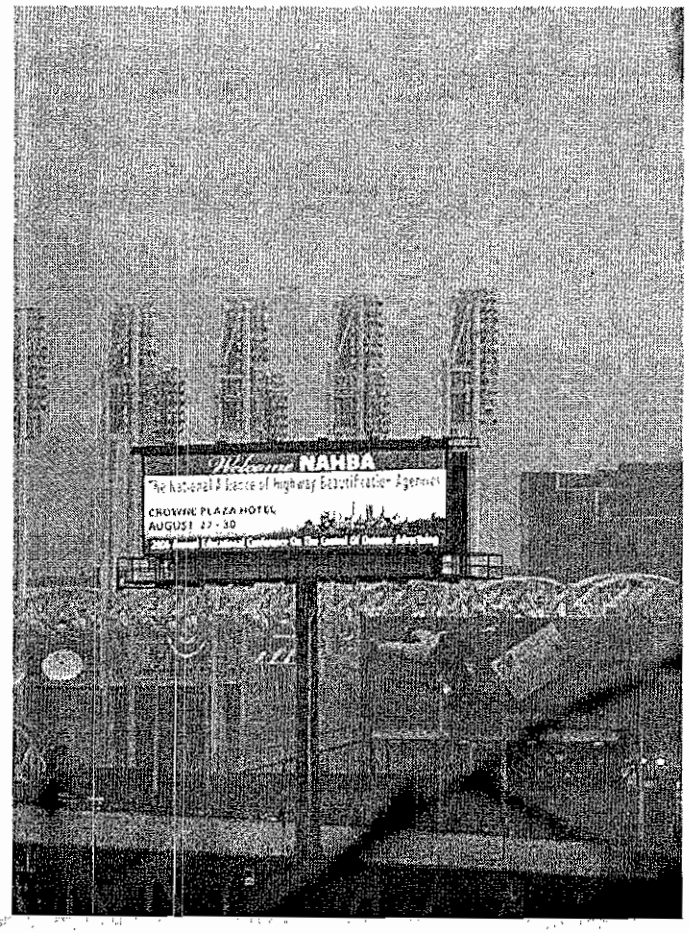
Unsafe and Unsightly at Any Speed

What's wrong with digital signs?

Aesthetic Concerns

Highway Safety Implications

Environmental Consequences

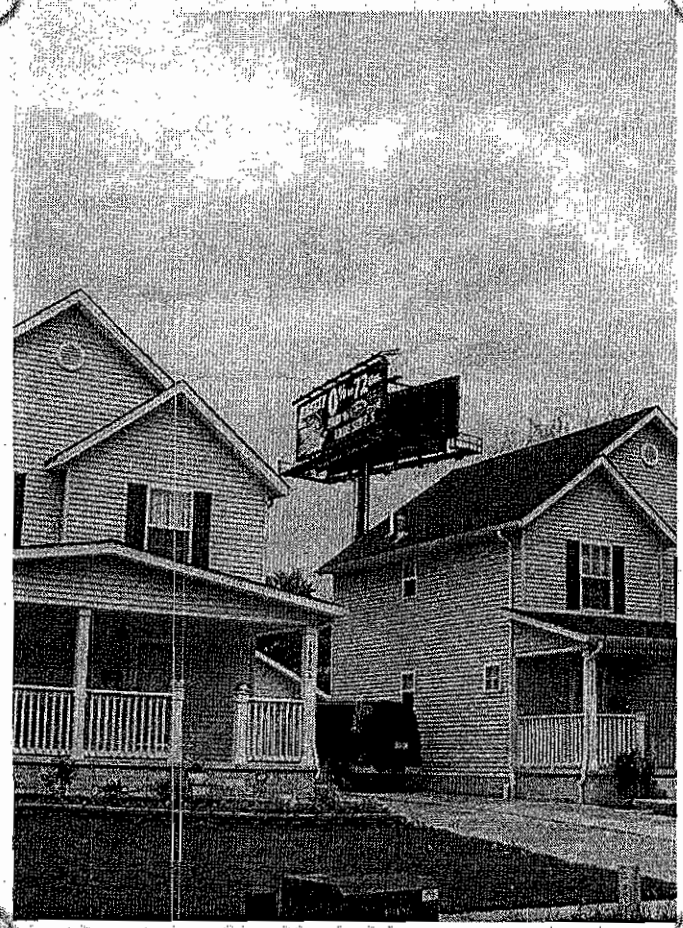


Aesthetics

- Brightest objects in the landscape
- Become dominant visual element and overwhelm the fundamental character of the place
- On-premise digital displays with motion can be particularly garish
- Distraction from other visual/scenic qualities
- Clash with historic or established architectural elements, even at great distances

Other Considerations

- Effects on property values
- Light and noise effects on nearby households and businesses
- Enormous compensation costs if signs are altered, moved, or removed



Highway Safety

- Brightest object in the driver's field of vision, especially at night
- Cause inadvertent and instinctual glances
- Images rotate every 4, 6, or 8 seconds causing lingering looks to see what's next
- Complex messages often take 5 seconds to comprehend

How bright is a digital billboard?

- The sun is measured at 6,500 nits
- During the daytime, a digital sign can be set at over 10,000 nits
- The Virginia Tech Transportation Institute found digital billboards to be 10X brighter than the surrounding area, and 3X brighter than a traditional billboard

What do we know?

(Source: 100-Car Naturalistic Driving Study, USDOT National Highway Traffic Safety Administration)

- Anything that distracts the driver from the forward roadway for more than **two seconds** significantly increases the chances of crashes and near crashes.
- 23% of crashes and near-crashes that occur in metropolitan environments are attributable to eyes off the forward roadway greater than **two seconds**.
- Nearly 80% of the crashes and 65% of near crashes were caused by distractions that made the driver look away for **up to three seconds**.

Some common-sense math: add it up

Brightest object in driver's field of vision that attracts inadvertent and unwilling glances

+

Frequently changing intermittent messages cause glances to linger to see what's next in the show

+

Complex advertising messages that take five seconds to comprehend

=

More than two seconds

The scientifically established driver distraction threshold is shattered by digital signs.

Can a digital sign simultaneously be safe for motorists and effective as an advertising medium?

- If the motorist spends enough time to read and comprehend the sign, by definition they have taken their eyes away from the driving task too long
- Digital signs are designed to pull drivers' attention from the roadway, otherwise they are useless as advertising
- Drivers already have too much distraction inside and outside the car
- Digital signs, because they are especially distracting due to bright light, vibrant color, and image changes or motion, divert attention from official signs that are necessary for the safe operation of the car

What research is coming?

- Federal Highway Administration is planning research (completion 2009)
- The American Association of State Highway and Transportation Officials (AASHTO) is sponsoring preliminary research leading to future investigations
- The Transportation Research Board of the National Academy of Sciences is conducting a human-factors workshop and will manage AASHTO research

What Should State and Local Governments Do?

The only responsible action is a **moratorium** on electronic billboard permits until all the data is in and public safety can be assured,

because ...

Communities may expose themselves to enormous liabilities

- The Highway Beautification Act requires cash compensation to sign owners of billboards on Interstate and federal-aid highways
- Compensation is usually defined as the value of the structure, plus lost revenue, making each digital sign worth millions of dollars
- The costs of compensating billboard owners will be enormous even in the course of normal highway widenings and improvements if the signs need to be moved or taken down
- Once studies are completed, and if the signs are found to be unsafe in their current configurations, any required changes to sign operations may cost governments millions in compensation payments
- Who will be held liable if accidents are influenced by the signs if it is shown that governments knowingly permitted their construction even in the face of pending research or critical safety studies?

But isn't there research that says these signs are safe?

The billboard industry sponsored two studies of digital signs in Cleveland conducted by Suzanne E. Lee and Tantala Associates, purporting to show they are safe.

According to the Philadelphia Inquirer (8/21/07), Clear Channel claims they paid for the research, although the reports say the Foundation for Outdoor Advertising Research and Education, an arm of the Outdoor Advertising Association of America.

The Maryland State Highway Administration commissioned human-factors expert Jerry Wachtel to assess the validity of the studies and prepare a peer-review report.

The Wachtel Report

Found serious deficiencies in both reports in terms of:

- Decisions and assumptions made in support of the research
- Methodology
- Review and application of cited literature
- Statistical methods, controls, and analyses
- Misleading and inconsistent reporting, and evidence of bias

"Having completed this peer review, it is our opinion that acceptance of these reports as valid is inappropriate and unsupported by scientific data, and that ordinance or code changes based on their findings is ill advised."

Jerry Wachtel, CPE
The Veridian Group, Inc,
Berkeley, California

A Critical, Comprehensive Review of Two Studies Recently Released by the Outdoor Advertising Association of America

Prepared for
Maryland State Highway Administration
October 18, 2007

Digital Signs and the Highway Beautification Act

- Violate the Highway Beautification Act itself
- Violate HBA regulations which prohibit "intermittent" lights
- Catastrophic Federal Highway Administration memorandum of September 25 ignores law, regulations, existing research, future research, potential financial liabilities, and common sense

FHWA memorandum

- Violates HBA provisions on off-premise signs
- Violates regulatory prohibition on signs with "intermittent" lights
- Permits signs before FHWA research completed
- Ignores NHTSA findings on two-second distraction threshold
- Ignores later costs if signs must be altered or removed
- Subverts federal rule-making requirements

Environmental Considerations

- One digital billboard consumes 397,486 kWh/year*
- The carbon footprint of one digital billboard = 49 traditional billboards or 13.39 homes
- One digital billboard = 108.41 tons/year of carbon dioxide
- Standard size digital billboard contains 449,280 light-emitting diodes

*Source: U.S. Green Buildings Council Central Balcones Chapter (Texas)

Scenic America

For More Information

www.scenic.org

ATTACHMENT "M"

PAS Report October 2008

PAS Essential

INFO PACKET

PAS EIP-06 October 2008

Regulating Electronic and Moving-Image Signs

The Planning Advisory Service (PAS) researchers are pleased to provide you with information from our world-class planning library. This packet represents a typical collection of documents PAS provides in response to research inquiries from our 1,500 subscribers. For more information about PAS visit www.planning.org/pas.

APA

American Planning Association

Making Great Communities Happen

Reports

- Baker, John and Wolpert, Robin. 2008. *Local Regulation of Dynamic Displays: Bridging Research, Planning Policy, and Law*. Greene Espel P.L.L.P. June 21.
    - Report on legal issues of dynamic sign regulation in Minnesota.

- Human Centered Systems Team, Office of Safety Research and Development, U.S. Federal Highway Administration. 2001. *Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction.* Washington D.C.: U.S. Department of Transportation, Federal Highway Administration.
    - Most-cited literature and regulation review.

- Minnetonka (Minnesota), City of. 2007. *An Ordinance Regulating Dynamic Signs.* Staff Report, City Council Agenda Item #14, Meeting of June 25.
    - Includes report *"Dynamic" Signage: Research Related to Driver Distraction and Ordinance Recommendations* by SRF Consulting Group, and copy of ordinance.

- Morris, Marya. 2008. "Looking Ahead: Regulating Digital Signs and Billboards." *Zoning News.* April.
    - Overview of issues surrounding types of moving signage and regulation. Also see related "Ask the Author" forum online at http://www.planning.org/zoningpractice/ask/2008/may.htm.

- U.S. Federal Highway Administration. 2007. "Guidance on Off-Premise Changeable Message Signs." Memorandum from Gloria M. Shepherd, Associate Administrator for Planning, Environment, and Realty, to division administrators. September 25
    - Gives approval to changeable message off-premise signs, including LED signage, that meet state and local laws.

- Scenic America. 2007. *Position Paper Regarding the Propriety of Permitting Digital Billboards on Interstate and Federal-Aid Highways under the Highway Beautification Act.*
    - Argues that digital billboards are impermissible based on FHWA regulations.

- Wallace, Brendan. 2003. "External-to-Vehicle Driver Distraction." Scottish Executive Social Research 168.
    - Literature review finds support for billboards as a source of driver distraction and road safety issues.

- Wisconsin Department of Transportation. 2003. "Electronic Billboards and Highway Safety." Transportation Synthesis Report, prepared by CTC & Associates, May 2/June 10.
    - Concludes "the jury is still out" on the safety impact of electronic billboards.

Regulations - Counties

- Carlton (Minnesota), County of. 2007. *An Ordinance Amending Ordinance No. 27 Carlton County Zoning Ordinance.* Approved November 13.
    - Electronic, video, and moving sign provisions.

- Salt Lake (Utah), County of, Planning and Development Services. 2008. *Code of Ordinances.* Title 19. Zoning. Chapter 19.82. Signs.
    - Definitions: animated sign, electronic message center, flashing sign, and illuminated sign.
    - Off premise billboard regulations for tri-vision, video displays, and electronic message centers.

Municipalities - Population Over 100,000

- Arlington (Texas), City of. 2007. *Code of Ordinances*. Zoning. Article 16. Sign Standards.
    - Definitions: electronic message center sign, flashing, gasoline price sign, motion, reader board.
    - Signs with motion or flashing lights banned. Electronic message center regulations; special regulations for major sports complex signs.

- Boston (Massachusetts), City of, Boston Redevelopment Authority. 2007. *Zoning Code.* Article 11. Signs. Section 11-7. Electronic Signs.
    - Definition: Sign, electronic.
    - Electronic signs are a conditional uses in three geographic districts and subject to regulation.

- Chicago (Illinois), City of. 2008. *Zoning Ordinance.* Chapter 17-12. Signs. Chapter 17.17. Terminology and Measurements.
    - Definitions: changing-image sign, electric sign, flashing sign, video display sign.
    - Flashing and changing images banned from temporary and incidental signs. Regulations for lighting, changing-image signs, flashing signs, and video display signs in residential, business, and commercial districts; three special sign districts have additional restrictions.

- Lafayette (Louisiana), City of. 2008. *Zoning Ordinance*. Article 4. Section 6. Signs.
    - Definitions: billboard/off-premise advertising sign, digital; flashing sign; readerboard.
    - Flashing banned; hold times for electronic readerboards; regulations for digital billboards.

- Mesa (Arizona), City of. 2008. *City Code*. Title 11. Zoning. Chapter 19. Sign Regulations.
    - Definitions: animated and electronic message display.
    - Prohibits animated, flashing, laser, moving signs; permits electronic message displays, subject to restrictions.

- Minneapolis (Minnesota), City of, and Municipal Code Corporation. 2008. *Zoning Code*. Chapter 520, Section 520.160. Introductory Provisions – Definitions. Chapter 543. On-Premise Signs. Chapter 544. Off-Premise Advertising Signs and Billboards.
    - Definitions: animated sign, flashing sign.
    - Three special off-premise billboard districts allow varying levels of animated, flashing, and electronic elements.

- Seattle (Washington), City of. 2008. *Land Use Code*. Chapter 23.55. Signs. Chapter 23.84. Definitions.

- Definitions: sign, changing-image; sign, chasing; sign, flashing; sign, electronic message board.
- Flashing and moving part signs prohibited. Regulations for video display signs.

Municipalities - Population Between 25,000 and 100,000

- Bloomington (Minnesota), City of, Planning and Economic Development Division. 2008. *City Code*. Chapter 19. Article 6. Billboards. Article 10. Sign Regulations.
  - Definitions: changeable copy sign, electronic; electronic graphic display sign; flashing sign; multi-vision sign (trivision); rotating sign; and video display sign.
  - Flashing signs prohibited; regulations for electronic changeable copy, video display, electronic graphic display, multi-vision, and rotating signs. Billboards: animation and moving parts prohibited but electronic display techniques allowed with restrictions.

- Cookeville (Tennessee), City of, Planning Department. 2006. *Zoning Code.* Section 207. General Sign Regulations.
  - Definitions: electronic message center, electronic display screens, flashing signs, illuminated signs, and multi-prism (i.e. trivision) signs.
  - Flashing signs prohibited; regulations for displays on electronic message centers, electronic display screens, and multi-prism displays.

- Glen Ellyn (Illinois), Village of. 2008. *Village Code*. Title 4. Chapter 5. Sign Code.
  - Flashing, moving part, and animated signs prohibited; regulations for changing signs and electronically variable message signs.

- Kent (Washington), City of. 2008. *City Code.* Chapter 15.06. Sign Regulations.
  - Animated, flashing, electronic video and certain revolving signs prohibited in all districts; tri-vision regulations for off-premise signs.

- Medina (Ohio), City of, and McKenna Associates. 2008. *Planning and Zoning Code.* Section 1147. Signs.
  - Standards for electronic message centers; animated signs prohibited.

- Oak Ridge (Tennessee), City of. 2006. *Zoning Ordinance.* Article XIV: Sign Regulations.
  - Definitions: animated, flashing, illuminated, moving copy signs.
  - Moving copy and LED channel signs allowed in certain districts; flashing signs prohibited.

- Oro Valley (Arizona), Town of. 2005. *Zoning Code.* Chapter 28: Signs.
  - Definitions: animation, electronic message, and changeable copy signs.
  - Changeable copy sign guidelines; LED allowed lighting allowed; animated, electronic message, flashing, and moving signs prohibited.

- San Luis Obispo (California), City of, Community Development Department. 2007. *Municipal Code*. Chapter 15.40. Sign Regulations.
  - Definition: attention-getting sign.
  - Attention getting signs banned, animated signs require architectural review. Regulations for sign illumination and EMCs.

- Tyler (Texas), City of. 2008. *Code of Ordinances*. Chapter 10. Development Standards. Division H. Sign Regulations.
    - Flashing and moving signs banned; regulations for electronic message centers.

- West Allis (Wisconsin), City of. 2007. *Municipal Code.* Chapter 13. Building Code. Section 13.21. Sign Code. Section 13.215. Central Business District (Downtown) Design Code.
    - Definitions: creative sign, electronic message center sign, and flashing sign. Prohibited signs: blinking, flashing, and rotating signs.
    - Regulations for changeable copy signs, electronic message centers, and creative signs.

- West Hollywood (California), City of. 2008. *Zoning Ordinance.* Chapter 19.34. Sign Standards.
    - "Creative billboard" guidelines; permits large-screen video signs in certain instances; restricts electronic graphic, flashing, or animated signs.

Municipalities - Population Under 25,000

- Benbrook (Texas), City of. 2008. *Zoning Regulations*. Section 25. Sign Regulations.
    - Animated, flashing, digital, moving, and video signs prohibited except for displays of time and temperature.

- East Dundee (Illinois), Village of, and Vandewall and Associates. 2007. *Code of Ordinances*. Title 15. Land Usage. Chapter 156. Signs.
    - Definitions: flashing signs, animated sign, full electronic message display, animated display, static electronic message display, dissolve, fade, frame, frame effect, transition.
    - Moving, animated, and flashing signs banned; electronic message displays limited to certain types and specific overlay districts.

- Homer (Alaska), City of. 2008. *City Code.* Chapter 21.60. Supplemental Regulations. Article 1. Sign Regulations.
    - Definitions: animated sign, changeable copy sign.
    - Allowed with sign permit in certain districts.

- Kalispell (Montana), City of. 2003. *Zoning Regulations*. Chapter 27.24. Sign Regulations.
    - Flashing, moving, and changing signs prohibited but electronic message centers allowed by permit with display guidelines.

- Maple Valley (Washington), City of. 2008. *Municipal Code.* Chapter 18.50. Particular Use Regulations.
    - Definitions: animated sign or display, electronic changeable message sign, flashing sign, holographic sign, moving sign, scrolling displays, time and temperature sign, and traveling displays.
    - Prohibited in all zones.

- Tavares (Florida), City of. 2005. *Land Development Regulations.* Chapter 21. Sign Regulations.

- Definitions: flashing sign, illuminated sign, and LED sign.
- Moving, flashing, and animated signs banned; LED sign regulations.

- Tonganoxie (Kansas), City of, and Bucher Willis Ratliff. 2007. *Zoning Ordinance*. Section 25. Signs.
  - Definitions: Animated sign, attention-getting device, electronic message board, and flashing sign.
  - Regulations for electronic message board regulations, large video screens for sporting areas, creative signs; attention-getting devices and flashing signs banned.

Reports

Local Regulation of Dynamic Displays: Bridging Research, Planning Policy, and Law

John M. Baker and Robin M. Wolpert
Greene Espel P.L.L.P.
200 S. Sixth Street, Suite 1200
Minneapolis, MN 55402
(612) 373-0830
JBaker@greeneespel.com
RWolpert@greeneespel.com

Updated October 3, 2008

Used with permission.

Contents

I. Three pillars of dynamic sign regulation 1

A. The authority of local government to regulate signs more restrictively than state and federal governments has been a pervasive and intended part of the overall system from the outset..... 1

B. A legally sufficient factual basis exists to adopt significant limits (or even bans) on dynamic signs. 2

C. Picking the best policy for your community unavoidably involves the degree of risk-aversion, and aesthetic and policy preferences, of your elected officials..... 4

II. Modes of regulation..... 6

A. Unsafe (and unlawful) at any speed: Complete or near-complete bans 6

1. Maple Valley, WA (2003): a complete ban 6

2. Concord, NH (2007 revisions) : total ban on all electronic message centers 8

3. St. Croix County, WI (June 19, 2007): a ban with a time-and-temperature exception..... 8

4. Bloomington, MN (2006): small steps short of a full ban 10

5. Judge Zimmerman's interim compromise in *Clear Channel Outdoor v. City of Minnetonka.* 13

B. Constitutional safety, for that city whose council just can't bring itself to "dumb down" that neat sign outside City Hall..... 13

1. Minnetonka's new approach to off-premise dynamic displays: citywide permission to operate, under distraction-reducing and proliferation-reducing conditions 13

C. Consolidating advertising in a few well-placed dynamic signs..... 17

1. Minnetonka's "incentives" provision 17

D. A Euclidean approach: allowing flashy signs in one or two zoning overlay districts..... 19

1. Minneapolis, MN's "downtown opportunity billboard district".... 19

2. East Dundee, IL's video display overlay district and static electronic display overlay district (2006)..... 20

E. *Encouraging* certain kinds of dynamic signs through regulation .. 22

1. Cuyahoga Falls, OH (2003)..... 22

III. At the "micro" level: recurring regulatory issues for dynamic signs25

A. There are seven key regulatory issues regarding dynamic signs: (1) the appropriate duration of dynamic messages, (2) whether, and under what conditions, to permit motion, animation, and video messages, (3) the appropriate level of brightness of dynamic signs, (4) the appropriate placement and spacing of signs, (5) whether to treat on-site and off-site dynamic signs differently, (6) the appropriate size of dynamic signs, and (7) the appropriate text size for dynamic signs. 25

B. Dynamic billboards cause driver distraction and pose risks to public safety..... 25

C. Regulatory options for duration of dynamic messages: what is the appropriate time interval between message changes?..... 26

D. Regulatory options for motion, animation, and video messages. .. 27

E. Regulatory options for the brightness of dynamic signs and external illumination..... 29

F. Regulatory options for sign placement and spacing..... 29

G. Regulatory distinctions between on-site and off-site signs..... 31

H. Regulatory options for the size of signs. 32

I. Regulatory options for the text size of dynamic signs. 33

I. Three pillars of dynamic sign regulation

A. The authority of local government to regulate signs more restrictively than state and federal governments has been a pervasive and intended part of the overall system from the outset.

a. Even before the federal Highway Beautification Act and Minn. Stat. §173 were adopted in 1965, the authority of Minnesota cities to independently regulate signs was well-established. *See, e.g., Arcadia Development Corp. v. City of Bloomington*, 267 Minn. 221, 227, 125 N.W.2d 846, 851 (1964) ("the city can unquestionably regulate, even stringently, the use, size, and position of business signs and advertising billboards.").

b. The HBA was intended to increase respect for local communities, not to ignore them. As President Johnson stated when articulating to Congress the goals of his initiative, "The roads themselves must reflect, in location and design, increased respect for the natural and social integrity *and unity of the landscape and communities through which they pass*." See Special Message to the Congress on Conservation and the Restoration of Natural Beauty, 1 Pub. Papers 159 (Feb. 8, 1965) (recommending legislation to control highway billboards) (emphasis added).

c. The "conflict of laws" provisions in the governing Minnesota statute seem intended to preclude state pre-emption:

(i) "Nothing in sections 173.01 to 173.11 shall be construed to abrogate or affect the provisions of any other law, municipal ordinance, regulation, or resolution which is more restrictive concerning advertising devices than are the provisions of such sections or of the rules adopted hereunder." Minn. Stat. § 173.10.

(ii) "Nothing in sections 173.13 to 173.231 shall be construed to abrogate or affect the provisions of

any other law, municipal ordinance, regulation, or resolution which is more restrictive concerning advertising than the provisions of said sections 173.13 to 173.231 hereof or of the regulations adopted thereunder." Minn. Stat. §173.20.

d. The Minnesota Department of Transportation's application form for an "advertising device permit" states that the permit is "Subject to Local Ordinance." http://www.dot.state.mn.us/tecsup/utility/oa/tp17197-auto.pdf.

e. In denying the plaintiffs' motion for a preliminary injunction in *Clear Channel Outdoor v. City of Minnetonka,* Court File No. 27-CV-06-23485 (Henn. Co. Dist. Ct. Jan. 30, 2007), Judge Lloyd Zimmerman stated that "the record does not demonstrate that the Minnesota legislature intended to occupy the field of outdoor billboard regulation, and preclude municipalities from imposing more restrictive rules. The relevant Minnesota statutes discussed above specifically contemplate more restrictive local control." *Id.* at 19. See also *Clear Channel Outdoor Inc. v. City of Arden Hills,* File No. 62-CV-07-3231 at 14 (Ramsey Co. Dist. Ct. August 1, 2008) (While the [Outdoor Advertising Control] Act regulates the samew thing as the City's Sign Code, the Sign Code is not preempted by the Act. Cities may independently regulate signs," and "the City's more restrictive regulations are not invalidated by the state statute.") (currently on appeal).

B. A legally sufficient factual basis exists to adopt significant limits (or even bans) on dynamic signs.

a. Long before large LED signs appeared, courts recognized that billboards can distract drivers, and that cities can regulate (or even ban) billboards for that reason. "No empirical studies are necessary for reasonable people to conclude that billboards pose a traffic hazard, since by their very nature they are designed to distract drivers and their passengers from maintaining their view of the

road." *Major Media of the Southeast v. City of Raleigh,* 621 F. Supp. 1446, 1450 (E.D.N.C. 1985).

(i) As Judge Diana E. Murphy wrote for the Eighth Circuit in August 2006 regarding an attempt to install billboards that would have completely changed their display every six to ten seconds (though "trivision" technology rather than digital technology), "distracting roadside billboards of the type Advantage sought to erect could also pose real danger to both motorists and nearby pedestrians." *Advantage Media LLC v. City of Eden Prairie*, 456 F.3d 793, 803 (8th Cir. 2006).

b. As explained in greater detail in the last half of this report, in this field – like many others – conclusive scientific proof is elusive, for reasons that need not preclude thoughtful regulation.

c. Legitimate studies of sign safety (conducted and sponsored by those without a financial interest in a particular answer) form pieces of a broader puzzle. When fit together properly, these pieces support the conclusion that the replacement of static signs with frequently-changing dynamic signs can create an added safety hazard.

(i) There is reason to believe that billboards tend to distract drivers.

(ii) There is reason to believe that *dynamic* billboards tend to distract drivers to a greater degree. Drivers are distracted to a dang*erous d*egree if their eyes are diverted from a highway for even two seconds (or, when congestion may require braking, for ¾ of a second).

(iii) Certain types of dynamic signs can create a "Zeigarnik effect" – named for a *human* behavioral pattern. When a sign appears to present a visual story or message, a driver may be motivated, or

even compelled, to watch the story through to completion.

d. In affirming the constitutionality of a flat ban on "electronic message center type signs," the City of Concord, New Hampshire's "legislative conclusion" that such signs are likely to prove distracting to drivers to the extent the signs are visible from roadways, thereby adversely affecting traffic safety, is hardly unreasonable, and would appear to be supported by common sense." *Nasar Jewelers, Inc. v. City of Concord, New Hampshire,* Civil No. 06-CV-400-SM at 9 (D.N.H. June 25, 2007) (citing *Chapin Furniture Outlet v. Town of Chapin,* 2006 WL 2711851, *4 (D.S.C. Sept. 20, 2006) ("Contrary to Plaintiff's contentions, the Town's judgment that flashing or scrolling signs constitute a traffic hazard and are inconsistent with the rural community aesthetic is not unreasonable")).

e. In affirming the *Concord* decision on appeal, the First Circuit stated that "[i]t is a given that a billboard can constitute a traffic hazard. It follows that EMCs, which provide more visual stimuli than traditional signs, logically will be more distracting and more hazardous." *Naser Jewelers, Inc. v. City Of Concord, N.H.,* 513 F.3d 27, 35 (1st Cir. 2008) (citing *Chapin Furniture Outlet*). "Indeed, plaintiff's own witnesses stated that bypassers focus more on rapidly blinking electronic signs than static signs. This constitutes a greater hazard." *Id.*

C. Picking the best policy for your community unavoidably involves the degree of risk-aversion, and aesthetic and policy preferences, of your elected officials.

a. Identifying a safety risk is just the beginning – cities must also consider how *averse* they are to that level of risk.

b. Sign regulation can and does involve values other than safety – such as aesthetic concerns (which are capable of

cutting either way on this subject), communication, wayfinding, and creativity.

c. As U.S. District Court Judge McAuliffe also concluded in *Nasar Jewelers,* "And, while taste and aesthetic sensitivity are debatable topics, it would seem well within the City's legitimate discretion to conclude that bright, colorful, electronic signs that change color and messages – or signs similar to those, are inconsistent with the aesthetic values the City seeks to promote." *Nasar Jewelers, Inc. v. City of Concord, New Hampshire,* Civil No. 06-CV-400-SM at 10 (D.N.H. June 25, 2007).A well-tred "middle path" –a general ban on signs that ch*ange, with a pub*lic information exception – is vulnerable to a First Amendment attack.

d. Following the lead of federal and state laws, many communities have carved out exceptions to allow dynamic signs that present "public service information," "electronic message centers," or signs owned by governments or non-profits.

e. However, in the eyes of *some* judges:

(i) A sign regulation is only as constitutional as its exceptions (*Metromedia v. City of San Diego,* 453 U.S. 490, 540 (1981) (plurality)), and

(ii) the constitutional requirement of content-neutrality should be taken literally, see *Advantage Media LLP v. City of Hopkins*, 379 F.Supp.2d 1030, 1040-41 (D. Minn. 2005) (Davis, J.); *Clear Channel Outdoor, Inc. v. City of St. Paul*, No. 02-1060 (DWF/AJB), 2003 WL 21857830 (D. Minn. Aug. 4, 2003) (Frank, J.), so that

(iii) exceptions for dynamic signs displaying public service information may violate the requirement of content-neutrality because their enforcement depends on what a sign says.

f. Even when content-neutrality is established, exceptions allowing the government itself to "participate in the vice" complicate its ability to justify treating such signs as harmful. *See Rubin v. Coors Brewing Co.*, 514 U.S. 476, 489 (1995) (there was "little chance" that the speech restriction could have directly and materially advanced its aim, "while other provisions of the same Act directly undermined and counteracted its effects"); *Lawson v. City of Kankakee, Ill.,* 81 F.Supp.2d 930, 934 (C.D.Ill. 2000) ("If the City were so worried that signs on terraces looked bad, it would not have chosen to place a sign there itself. Surely its own sign is no less unattractive than Plaintiff's.").

(i)

II. Modes of regulation

a. Whether and how to regulate dynamic signs are discretionary choices. Those choices should be made in light of the pillars of dynamic sign regulation and the local government's cost-benefit analysis of safety, aesthetics, planning, and other policy considerations.

b. Local governments that have devoted the most attention to this subject recently have taken approaches that tend to fall within six discrete "modes" of regulation, ranging from an absolute or near-absolute prohibition of dynamic signs to encouraging dynamic signs.

A. Unsafe (and unlawful) at any speed: Complete or near-complete bans

1. Maple Valley, WA (2003): a complete ban

a. ORDINANCE NO. O-03-228, Amending Title 18 of the Maple Valley Municipal Code relating to signs

D. PROHIBITED SIGNS:

The following signs or displays are prohibited in all zones within the City.

* * *

3. Animated signs or displays;

* * *

6. Electronic changeable message signs,[1] except for temporary signs required by government agencies for road and street repairs, and similar activities. This prohibition includes, but is not necessarily limited to, signs which include animation, flashing, traveling, or scrolling messages or displays[2];

7. Flashing signs[3] or displays,;

* * *

12. Moving signs;

* * *

14. Festoons, pennants, or blinking lights;

---

[1] DEFINITIONS: * * * 24. Electronic Changeable Message Sign: An electronically activated sign whose message content or display, either whole or in part, may be changed by means of electrical, electronic or computerized programming. A sign or portion of a sign on which the message or display is an electronic indication of fuel price shall be considered an Electronic Changeable Message Sign. A sign on which the sole message or display is an electronic indication of time and/or temperature shall be considered an Electronic Changeable Message Sign. Drive-through Business/menu signs are not considered Electronic Changeable Message Signs.

[2] DEFINITIONS: * * * 72. Scrolling Displays: The vertical movement of a static message or display on an electronic changeable message sign.

[3] DEFINITIONS: * * * 29. Flashing Sign: A sign of which any portion of it changes light intensity, switches on and off in a constant pattern, or contains moving parts or the optical illusion of motion caused by use of electrical energy or illumination, with a display that appears for less than one and one-half consecutive seconds.

2. **Concord, NH (2007 revisions) : total ban on all electronic message centers**

   a. It prohibits all signs that "appear animated or projected" or " are intermittently or intensely illuminated or of a traveling, tracing, scrolling, or sequential light type" or "contain or are illuminated by animated or flashing light." Code of Ordinances 28-6-7(h).

   b. On January 18, 2008, the U.S. Court of Appeals for the First Circuit upheld the constitutionality of this ban. See above).

3. **St. Croix County, WI (June 19, 2007): a ban with a time-and-temperature exception**

   a. St. Croix County Code of Ordinances/Land Use and Development

   b. Findings of Fact (§17.65(A) (1) (a)(3, 7)):

      (i) "Signs can create safety hazards that threaten the public health, safety or welfare. Such a safety threat is particularly great for signs that are structurally inadequate, or that may confuse or distract drivers or pedestrians, or that may interfere with official directional or warning signs."

      (ii) "With one narrow exception, only static signs (which change, if at all, only on rare occasions when they are repainted or covered with a new picture) constitute a customary use of signage in the County.[4] The only non-static signs that

[4] St. Croix County's findings regarding "customary use" have the intended effect of causing "non-customary use" signs that are adjacent to federal-aid highways to also violate the federal Highway Beautification Act, even if they are in a commercial or industrial zone. See 23 U.S.C. § 131 (d) ("Whenever a bona fide State, county, or local zoning authority has made a determination of customary use, such determination will be accepted in lieu of controls by agreement in the zoned commercial and industrial areas within the geographical jurisdiction of such authority.") and Wisc. Trans. R. 201.20 (5).

constitute a customary use of signge in the County are components of on-premise signs for which frequent changes are necessary for the purpose of updating numerical hour-and-minute, date, and temperature information. Such changes are unique because their accuracy depends upon their ability to frequently change, and because in their customary use such signs are apt to distract drivers or pedestrians to a dangerous degree than other types of non-static signs."

c. Prohibitions (§ 17.65 (C) (3)):

d. Signs and sign components and elements of faces of signs shall not flash, move, travel or use animation.

e. Unless a sign's only illumination is external and uncolored, the following additional regulations shall also apply to that sign:

(i) No illuminated off-premises sign which changes in color or intensity of artificial light at any time while the sign is illuminated shall be permitted.

(ii) No illuminated on-premises sign which changes in color or intensity of artificial light at any time when the sign is illuminated shall be permitted, except one for which the changes are necessary for the purpose of correcting hour-and-minute, date, or temperature information.

(iii) A sign that regularly or automatically ceases illumination for the purpose of causing the color or intensity to have changed when illumination resumes shall fall within the scope of the prohibitions of par. f. 1) and 2) above.

(iv) The scope of [this subsection's] prohibitions include, but are not limited to, any sign face that includes a video display, LED lights that change in color or intensity, 'digital ink,' and any other

method or technology that causes the sign face to present a series of two or more images or displays.

4. Bloomington, MN (2006): small steps short of a full ban

a. Bloomington Zoning Code §§ 19.66 and 19.100-108.

b. Findings (§ 19.100):

(i) "With respect to electronic signs, including video display signs, the City Council finds that they are highly visible from long distances and at very wide viewing angles both day and night and are designed to catch the eye of persons in their vicinity and hold it for extended periods of time. If left uncontrolled, electronic signs, including video display signs, constitute a serious traffic safety threat." A set of enumerated reports and studies "reveal that electronic signs are highly distracting to drivers and that driver distraction continues to be a significant underlying cause of traffic accidents."

c. Prohibitions (§§ 19.66(b), and 19.108 (h) (4-6, 8)):

d. **Billboards** (i.e. advertising signs which have an area exceeding 150 square feet)) **which utilize electronic display techniques-**

(i) **must have a minimum duration of 20 minutes and must be a static display**;

(ii) cannot move or appear to move;

(iii) cannot fluctuate in light intensity or use intermittent, strobe or moving light to create the illusion of movement;

(iv) are only permitted in certain commercial and industrial districts; and

(v) must meet specified standards prohibiting non-instantaneous transitions, limiting brightness, and requiring dimmer controls.

e. **Video display signs** (i.e. a sign that changes its message or background in a manner or method of display characterized by motion or pictorial imagery, which may or may not include text and depicts action or a special effect to imitate movement, the presentation of pictorials or graphics displayed in a progression of frames which give the illusion of motion, but not including electronic changeable copy signs as defined below) that are not billboards-

(i) must not be visible from residential property or from any motored way,

(ii) are excluded from residential, conservation and bluff protection zones; and

(iii) must be set back 100 feet from an abutting residential district and 35 feet from other electronic changeable copy signs.

f. **Electronic graphic display signs** (i.e. a sign or portion thereof that displays electronic, static images, static graphics or static pictures, defined by a small number of matrix elements using different combinations of LEDs, fiber optics, light bulbs or other illumination devices within the display area where the message change sequence is accomplished immediately or by means of fade, repixalization or dissolve modes) that are not billboards-

(i) cannot change more frequently than every 20 minutes;

(ii) may be seen from a motored way, but must not be visible from residential property if within 150 feet;

(iii) are excluded from residential, conservation, and bluff protection zones; and

(iv) must be set back 100 feet from an abutting residential district and 35 feet from other changeable copy signs.

g. **Electronic changeable copy signs** (i.e. a sign or portion thereof that displays electronic, non-pictorial, text information in which each alphanumeric character, graphic, or symbol is defined by a small number of matrix elements using different combinations of LEDs, fiber optics, light bulbs or other illumination devices within the display area, but not including time-and-temperature signs as defined below) that are not billboards-

(i) **may include up to ten words of text, but not pictures**;

(ii) **cannot change more frequently than every 8 seconds (in a non-residential area), and every one hour in a residential area**;

(iii) may be seen from a motored way, but must not be visible from residential property if within 150 feet;

(iv) may in theory appear in a residential zone, but not in a conservation or bluff protection zone;

(v) must be set back 100 feet from an abutting residential district and 35 feet from other changeable copy signs.

h. **Time and temperature signs** (i.e. a sign which displays exclusively current time and temperature information) that are not billboards –

(i) Cannot change more frequently than every 2 seconds;

(ii) No visibility or special setback limits; and

(iii) are excluded from residential, conservation, and bluff protection zones.

5. Judge Zimmerman's interim compromise in *Clear Channel Outdoor v. City of Minnetonka.*

a. In his order on reconsideration, Judge Lloyd Zimmerman ruled that, on an interim basis, the City could not interfere with the operation of the two LED signs installed by Clear Channel "during daytime hours, to the extent that (a) the electronic messages on the sign change no more than once each hour (b) the brightness, color, and illumination of the signs are calibrated by Clear Channel to the minimal level of illumination equivalent to conventional non-LED electronic billboard signs. Pending the outcome of this litigation, Clear Channel is enjoined from operating the two signs before and after day-light hours."

B. Constitutional safety, for that city whose council just can't bring itself to "dumb down" that neat sign outside City Hall

1. Minnetonka's new approach to off-premise dynamic displays: citywide permission to operate, under distraction-reducing and proliferation-reducing conditions

a. The provisions that have been replaced:

(i) [in the criteria in subd. 4 for a monument identification sign], "7) *message centers/time and temperature displays permitted* but the maximum area for display is 50 percent of the potential copy and graphic area of the monument identification sign."

(ii) [in the prohibitions section], "revolving and moving signs *except electronic message center/time and temperature display signs according to subdivision 4* and search lights according to subdivision 8," and "flashing, blinking or animated signs including but not limited to traveling lights or any other means not providing constant illumination *except electronic message center/time and temperature display signs*

according to subdivision 4 and search lights according to subdivision 8."

(iii) The City's definition of "flashing sign" is very broad, extending the ban to signs on which illumination is not kept stationary or constant in intensity and color at all times when such sign is in use." §300.02 (117).

b. The new prohibition: "signs with dynamic displays **except** search lights under subdivision 8 and **those allowed under subdivision 14**;"

c. New subsection 14 ("Dynamic Displays")

a) Findings. Studies show that there is a correlation between dynamic displays on signs and the distraction of highway drivers. Distraction can lead to traffic accidents. Drivers can be distracted not only by a changing message, but also by knowing that the sign has a changing message. Drivers may watch a sign waiting for the next change to occur. Drivers are also distracted by messages that do not tell the full story in one look. People have a natural desire to see the end of the story and will continue to look at the sign in order to wait for the end. Additionally, drivers are more distracted by special effects used to change the message, such as fade-ins and fade-outs. Finally, drivers are generally more distracted by messages that are too small to be clearly seen or that contain more than a simple message. Time and temperature signs appear to be an exception to these concerns because the messages are short, easily absorbed, and become inaccurate without frequent changes.

Despite these public safety concerns, there is merit to allowing new technologies to easily update messages. Except as prohibited by state or federal law, sign owners should have the opportunity to use these technologies with certain restrictions. The restrictions are intended to minimize potential driver distraction and to minimize proliferation in residential districts where signs can adversely impact residential character.

Local spacing requirements could interfere with the equal opportunity to use such technologies and are not included. Without those requirements, however, there is the potential for numerous dynamic displays to exist along any roadway. if more than one dynamic display can be seen from a given location on a road, the minimum display time becomes critical. If the display time is too short, a driver could be subjected to a view that appears to have constant movement. This impact would obviously be compounded in a corridor with multiple signs. If dynamic displays become pervasive and there are no meaningful limitations on each sign's ability to change frequently, drivers may be subjected to an unsafe degree of distraction and sensory overload. Therefore, a longer display time is appropriate.

A constant message is typically needed on a sign so that the public can use it to identify and find an intended destination. Changing messages detract from this way-finding purpose and could adversely affect driving conduct through last-second lane changes, stops, or turns, which could result in traffic accidents. Accordingly, dynamic displays generally should not be allowed to occupy the entire copy and graphic area of a sign.

In conclusion, **the city finds that dynamic displays should be allowed on signs but with significant controls to minimize their proliferation and their potential threats to public safety**.

b) Regulations. Dynamic displays on signs are allowed subject to the following conditions:

1) Dynamic displays are allowed only on monument and pylon signs for conditionally permitted uses in residential districts and for all uses in other districts. **Dynamic displays may occupy no more than 35 percent of the actual copy and graphic area.** The remainder of the sign must not have the capability to have dynamic displays even if not used. Only one, contiguous dynamic display area is allowed on a sign face;

2) **A dynamic display may not change or move more often than once every 20 minutes, except one for which changes are necessary to correct hour-and-minute, date, or temperature information.** Time, date, or temperature information is considered one dynamic display and may not be included as a component of any other dynamic display. A display of time, date, or temperature must remain for at least 20 minutes before changing to a different display, but the time, date, or temperature information itself may change no more often than once every three seconds;

3) The images and messages displayed must be static, and the transition from one static display to another must be instantaneous without any special effects;

4) The images and messages displayed must be complete in themselves, without continuation in content to the next image or message or to any other sign;

5) **Every line of copy and graphics in a dynamic display must be at least seven inches in height on a road with a speed limit of 25 to 34 miles per hour, nine inches on a road with a speed limit of 35 to 44 miles per hour, 12 inches on a road with a speed limit of 45 to 54 miles per hour, and 15 inches on a road with a speed limit of 55 miles per hour or more. If there is insufficient room for copy and graphics of this size in the area allowed under clause 1 above, then no dynamic display is allowed**;

6) Dynamic displays must be designed and equipped to freeze the device in one position if a malfunction occurs. The displays must also be equipped with a means to immediately discontinue the display if it malfunctions, and the sign owner must immediately stop the dynamic display when notified by the city that it is not complying with the standards of this ordinance;

C. Consolidating advertising in a few well-placed dynamic signs

1. Minnetonka's "incentives" provision

a. **Purposes and Findings**:

Outdoor advertising signs do not need to serve the same way-finding function as do on-premises signs. Further, outdoor advertising signs are no longer allowed in the city, and there is no potential that they will proliferate. Finally, outdoor advertising signs are in themselves distracting and their removal serves public safety. The city is extremely limited in its ability to cause the removal of those signs. **This clause is intended to provide incentives for the voluntary and uncompensated removal of outdoor advertising signs in certain settings. This removal results in an overall advancement of one or more of the goals set forth in this section that should more than offset any additional burden caused by the incentives. These provisions are also based on the recognition that the incentives create an opportunity to consolidate outdoor advertising services that would otherwise remain distributed throughout the community.**

b. Criteria for issuance of an enhanced dynamic signage permit:

c. (1) "A person may obtain a permit for an enhanced dynamic display on one face of an outdoor advertising sign if the following requirements are met:"

(a) **The applicant agrees in writing to permanently remove, within 15 days after issuance of the permit, at least two other faces of an outdoor advertising sign in the city that are owned or leased by the applicant, each of which must satisfy the criteria of parts (b) through (d) of this subsection.** This removal must include the complete removal of the structure and foundation supporting each sign face. The applicant must agree that the city may remove the sign if the applicant

does not timely do so, and the application must be accompanied by a cash deposit or letter of credit acceptable to the city attorney sufficient to pay the city's costs for that removal. The applicant must also agree that it is removing the sign voluntarily and that it has no right to compensation for the removed sign under any law.

(b) The city has not previously issued an enhanced dynamic display permit based on the removal of the particular faces relied upon in this permit application.

(c) **Each removed sign has a copy and graphic area of at least 288 square feet and satisfies two or more of the following additional criteria:**

(1) The removed sign is located adjacent to a highway with more than two regular lanes and with a general speed limit of 45 miles per hour or greater, but that does not have restrictions on access equivalent to those of an interstate highway;

(2) All or a substantial portion of the structure for the removed sign was constructed before 1975 and has not been substantially improved;

(3) The removed sign is located in a noncommercial zoning district;

(4) The removed sign is located in a special planning area designated in the 1999 comprehensive plan; or

(5) The removed copy and graphic area is equal to or greater than the area of the copy and graphic area for which the enhanced dynamic display permit is sought.

(d) If the removed sign face is one for which a state permit is required by state law, the applicant must surrendered its permit to the state upon removal of the sign. The sign that is the subject of the enhanced dynamic display permit cannot begin to operate until proof is

provided to the city that the state permit has been surrendered.

(e) **The applicant must agree in writing that no dynamic displays will ever be used on one additional outdoor advertising sign that has a copy and graphic area of at least 288 square feet in size.** This agreement will be binding on the applicant and all future owners of the sign. If the sign is subsequently removed or destroyed and not replaced, the holder of the enhanced dynamic display permit is not required to substitute a different sign for the one that no longer exists.

d. **The benefits of an enhanced dynamic display permit**:

2) If the applicant complies with the permit requirements noted above, the city will issue an enhanced dynamic display permit for the designated outdoor advertising sign. **This permit will allow a dynamic display to occupy 100 percent of the potential copy and graphic area and to change no more frequently than once every eight seconds.** The designated sign must meet all other requirements of this ordinance.

D. A Euclidean approach: allowing flashy signs in one or two zoning overlay districts

1. Minneapolis, MN's "downtown opportunity billboard district"

a. The City's "Downtown 2010 Entertainment Policy" noted that the policy's goals would be furthered by steps to "create street level excitement in the Entertainment District. A successful urban entertainment district requires a street level environment that is visually exciting and that encourages pedestrian flow between various attractions."

b. Minneapolis City Code § 544.60. Opportunity billboard districts, provides:

(a) Establishment and restrictions. This section establishes the following opportunity billboard districts:

* * *

(2) Downtown opportunity billboard district. The downtown opportunity billboard district shall comprise the area bounded by the Mississippi River, I-35W, I-94, and I-394/Third Avenue North (extended to the river), except that in no case shall a sign or billboard be constructed or structurally altered along or within three hundred (300) feet of either side of Nicollet Avenue between Washington Avenue and Ninth Street South, between LaSalle Avenue and Marquette Avenue between Ninth Street South and Grant Street, or north of Washington Avenue. No advertising sign or billboard shall be constructed or structurally altered within the downtown opportunity billboard district except as provided in this section and subject to all other applicable regulations of this zoning ordinance.

c. Minneapolis City Code § 544.20 (13). General provisions - Flashing signs, provides:

Flashing, blinking or animated signs, including but not limited to traveling lights or other means not providing constant illumination, shall be prohibited **except in the downtown opportunity billboard district. Such signs shall be allowed in the downtown opportunity billboard district, provided flashing signs containing changing written messages shall be limited to the news, weather, time or other public service messages, and provided further that the vertical dimension of such changing written message shall not exceed four (4) feet.**

2. East Dundee, IL's video display overlay district and static electronic display overlay district (2006)

a. James Carlini, one of the Trustees of the Village of East Dundee, has characterized sign ordinances as a "horse-and-buggy bridle on business," and has advocated that local governments should "turn on profits by turning on the lights." James Carlini, "Electronic Signs for

Municipalities: Las Vegas or Lost Revenues?" Wisconsin Technology Network, online edition, 05/17/06.

b. In 2006, East Dundee amended its sign ordinance in the following respects:

(i) In the East Side Commercial Overlay District, "*for new car dealerships, multi-tenant retail centers and amusement establishments only*, the freestanding sign permitted" on a parcel "may contain a fully electronic message display consisting of words, symbols, figures or images that can be electronically or mechanically changed by remote or automatic means, *including animated graphics and video,* subject to the following: (a) the area of the electronic message shall not exceed 75 % of the sign area; and (b) the intensity of illumination and the movement of any illumination or the flashing, scintillating or varying of light intensity shall not constitute a traffic hazard as described in subsection 156.03(E)[7]." Ordinance No. 06-46, amending Code of Ordinances § 156.04 (E).

(ii) In the Hilltop Commercial Overlay District, "*for new car dealerships, multi-tenant retail centers and amusement establishments only,* the freestanding sign may contain a *static electronic message display capable of displaying words, symbols, figures or images that can be electronically or mechanically changed by remote or electronic means,*" subject to the same 75 percent limit and traffic hazard limit as signs in the

[7] Under 156.03(E), "In order to assure traffic safety, no sign shall be erected, relocated or maintained in a manner as will, in the determination of the Building Official, (1) by reason of size, location, content, coloring or manner of illumination, obstruct the vision of drivers or obstruct or detract from the visibility or effectiveness of any traffic signal or control device on streets and roads within the village; or (2) make use of words, phrases, symbols, lights or characters, in a manner as to interfere with, mislead or confuse traffic."

other overlay district, plus a requirement that "each message on the sign shall be displayed for a minimum of 10 seconds," and "said messages shall change only through dissolve or fade transitions, or with the use of other subtle transitions and frame effects that do not have the appearance of moving text or images, but which may otherwise not have movement, or the appearance or optical illusion of movement, of any part of the sign structure, design or pictorial segment of the sign, including movement of any illumination or the flashing, scintillating or varying of light intensity." Ordinance No. 06-46, amending Code of Ordinances § 156.04 (F).

(iii) Everywhere else in the Village, "flashing signs" shall be prohibited, "moving, rotating, or animated signs or signs creating the illusion of movement shall be prohibited," and "illumination shall be constant in intensity and color, and shall not consist of flashing, animated, chasing, scintillating or other illumination conveying the sense of movement except for those signs that exhibit time and temperature . . ." Ordinance No. 06-46, amending Code of Ordinances § 156.03 (F) and (G)(5).

E. *Encouraging* certain kinds of dynamic signs through regulation

1. Cuyahoga Falls, OH (2003)

a. Cuyahoga Falls' 2003 overhaul of its sign ordinance is characterized as an "outside the box" approach by the planning consultant who drafted it, John Gann of Gann Associates. Gann believed that "the best solution to temporary clutter is permanent signs with designed-in readerboards or electronic message centers. Temporary signs exist because businesses and other sign users have a legitimate need to display temporary messages. Doing this on a permanent panel that is physically part of and visually integrated with a good permanent sign may be

the most compatible way to do this." Author's Answers to Questions about "Sign Control in Cuyahoga Falls: Regulating Outside the Box" (July 2003 Zoning News), available on the American Planning Association website.

b. § 1147.03 (C): Displays prohibited:

(i) d. Flashing signs.

(ii) f. Moving signs.

c. § 1147.06.A: Rules for Special Signs: Changeable Sign Areas

(i) "1. *Sign Area Bonus for Inclusion in Permanent Sign.* To meet the need businesses and organizations have for timely and variable sign messages and also to prevent the clutter that can be created by portable signs, *the Permanent Sign Allowance of a property shall be increased as provided in Table 1147-4 if a changeable copy area or electronic message center*, both as defined herein, of no less than 16 square feet *is incorporated into a permanent non-portable Non-Surface Sign on the lot or building site*."

(ii) Under Table 1147-4, the lawful surface area of a permanent sign – known as its "permanent sign allowance" – increases by 20 percent if "a changeable copy area or electronic message center is permanently part of a permanent non-portable sign conforming to 1147.06.A.

(iii) 2. *Single Electronic Message Center.* Electronic message centers shall be allowed only on a single Permanent Sign per lot or building site.

(iv) 3. *Integration into Sign.* Changeable copy areas and electronic message centers on permanent signs shall be part of the same sign panel as a non-changeable sign and shall be integrated into the face of such sign by use of a border or similar

design treatment that provides a visual linkage to the rest of the sign.

(v) 4. *Maximum Area.* A changeable copy area or electronic message center, both as defined herein, shall be no more than 60 percent of the actual sign area of any permanent sign panel of which it is a part.

(vi) 5. *On Temporary or Portable Signs.* No temporary or portable sign shall display a changeable copy area or electronic message center.

III. At the "micro" level: recurring regulatory issues for dynamic signs

A. There are seven key regulatory issues regarding dynamic signs: (1) the appropriate duration of dynamic messages, (2) whether, and under what conditions, to permit motion, animation, and video messages, (3) the appropriate level of brightness of dynamic signs, (4) the appropriate placement and spacing of signs, (5) whether to treat on-site and off-site dynamic signs differently, (6) the appropriate size of dynamic signs, and (7) the appropriate text size for dynamic signs.

a. In assessing what regulatory options achieve their policy goals, local governments may consider the safety risks associated with dynamic signs and the costs and benefits of various regulatory options.

b. SRF Report for the City of Minnetonka: In connection with litigation regarding dynamic signs in the City of Minnetonka, SRF prepared a report for the City that reviewed selected safety studies, identified the safety risks associated with dynamic signs, and identified regulatory options.

B. Dynamic billboards cause driver distraction and pose risks to public safety.

a. To assess the safety implications of dynamic and static signs, road safety scholars have examined (1) the relationship between static or dynamic signs and crash rates, (2) how drivers process information and limitations on their ability to process information, and (3) the factors contributing to driver distraction and the risk of crashes.

b. In general, the results of these studies indicate that dynamic billboards cause driver distraction and driver distraction causes traffic accidents. Dynamic billboards, with their ability to display high resolution color images and changing and moving images, capture the attention of drivers and capture the attention of drivers for longer periods of time than static signs. Indeed, the billboard companies design dynamic billboards precisely for the

purpose of capturing the attention of the public and maximizing profitability. When drivers are looking at dynamic billboards, they are distracted and distracted drivers increase the risk of crashes and pose problems for road safety and traffic operations. Driver distraction alone can be the cause of accidents. In addition, driver distraction interacts with roadway conditions, driving environments, weather, and traffic conditions to cause accidents.

C. Regulatory options for duration of dynamic messages: what is the appropriate time interval between message changes?

a. The implications of duration for safety: prior research indicates that the duration of dynamic messages has implications for safety:

(i) Glances of two seconds or greater double the risk of crashes or near crashes

(ii) Visual fixations on roadway signs decrease as route familiarity increases (but this decrease in visual fixations may not occur with signs that change messages)

(iii) Dynamic billboards attract more glances and longer glances than static signs and the length of those longer glances (greater than .75 seconds) is close to the minimum perception-reaction time required for a driver to react to a slowing vehicle

(iv) Signs with a visual story or message that carries for two or more frames are particularly distracting because drivers tend to focus on the message until it is completed rather than the driving task at hand

(v) Due to a Zeigarnik effect (the psychological need to follow a task to its conclusion), the desire to see a message change or read a sequence of messages causes driver distraction and unsafe driving behavior like prolonged glances away from the road, slowing, and lane departure

b. Suggested regulatory goals and options

(i) Minimize the Ziegarnik effect (the desire to see a message change) and the driver distraction associated with watching dynamic signs change by setting the duration of sign messages to minimize the number of new messages seen by drivers. This can be calculated based on the length of time a sign is visible for particular driver's speed, speed limits, and traffic volume. *See* SRF Report at A24-25.

(ii) Minimize the Ziegarnik effect by requiring a dark period between successive messages. *See* SRF Report at A24.

(iii) Prohibit flashing, spinning, revolving transition methods that are distracting. *See* SRF Report at A24.

(iv) Reduce driver distraction by prohibiting signs that require or induce drivers to watch a sign for several seconds, such as signs with visual stories, signs carrying messages that are delivered through a sequence of displays, flashing messages (or by limiting such signs to certain driving environments).

(v) Reduce driver distraction by insuring that signs are conspicuous and legible.

D. Regulatory options for motion, animation, and video messages.

a. The implications of motion, animation, and video messages for safety: prior research indicates that:

(i) Video and tri-vision signs attract more long glances than static and scrolling text signs

(ii) Video and scrolling text signs received the longest average glance duration

(iii) Video signs entering into a driver's line of sight directly in front of the vehicle are very distracting

(iv) Electronic signs with moving images contribute to driver distraction for longer intervals than electronic signs with no movement

(v) Signs with a visual story or message that carries for two or more frames are particularly distracting because drivers tend to focus on the message until it is completed rather than the driving task at hand

(vi) Scrolling messages and sequences of messages increase driver distraction

(vii) Flashing messages require more time to read and more time to comprehend and require more of the driver's time and attention

b. Suggested Regulatory Goals and Options

(i) Minimize driver distraction by prohibiting video, tri-vision, scrolling text, flashing signs, or any other type of motion in dynamic signs or restricting motion to signs located in certain driving environments.

(ii) Set a maximum motion time frame based on the length of time a sign is visible for particular driver's speed, speed limits, and traffic volume. *See* SRF Report at A24-25.

(iii) Reduce driver distraction by prohibiting signs that require or induce drivers to watch a sign for several seconds, including signs with visual stories, signs carrying messages that are delivered through a sequence of displays, flashing messages.

E. Regulatory options for the brightness of dynamic signs and external illumination.

a. The implications of brightness for safety: brightness can distract drivers and impair their ability to perform driving tasks. Previous research indicates that that the brightness of dynamic signs can temporarily blind a driver or prompt a driver to look away from the light. Newer sign technologies permit dynamic signs to respond to ambient light conditions, raising additional concerns about the adequacy of those changing brightness levels.

b. The challenges of brightness regulation: there is no objective definition of excessive brightness because the appropriate level of brightness depends on the environment within which the sign operates. Accordingly, it is difficult to establish a uniformly applicable measure of brightness for all dynamic signs. In addition, the instruments that are used to measure brightness in the field are currently very expensive and it is difficult to measure brightness in the field. For all these reasons, the enforcement of any brightness regulations is challenging.

c. Regulatory Options

(i) City of Minnetonka: "No sign may be brighter than is necessary for clear and adequate visibility."

(ii) Prohibit brightness that impairs the vision of a driver or promotes driver distraction.

(iii) Prohibit brightness that interferes with traffic control devices.

F. Regulatory options for sign placement and spacing.

a. The implications of sign placement and spacing for safety: previous research indicates that:

(i) The number of advertising signs per mile (or road section) is positively associated with crash rates,

i.e., the more advertising signs per mile (or road section), the higher the crash rate

(ii) Intersections containing advertising signs have a higher crash rate than those containing no advertising signs

(iii) Street level advertising signs are more distracting than raised advertising signs

(iv) The less conspicuous the sign, the higher the likelihood of an increased crash rate

(v) Signs pose a safety hazard when they obstruct a driver's line of sight at an intersection, curve, or point of egress from an adjacent property or obstruct a driver's view of a traffic control device

(vi) Signs pose a safety hazard when they are located where heightened driver concentration is required (high pedestrian volume intersection) or when they are likely to be mistaken for a traffic control device or as an instruction to drivers

(vii) Signs with a visual story or message that carries for two or more frames are particularly distracting because drivers tend to focus on the message until it is completed rather than the driving task at hand

b. Challenges

(i) Regulating sign spacing can be like starting a game of "musical chairs" because the ability of one company to put up a sign at one location can depend on whether another company has already put up a sign within the immediate vicinity.

(ii) This can create problems of equity because similarly situated property owners end up with different rights.

(iii) It can also create a "race" to engage in exactly the behavior that the local government is trying to regulate, because those who are first in the neighborhood to engage in the behavior are the least likely to be burdened by spacing requirements.

c. Suggested regulatory goals and options

(i) To the extent that federal and state spacing requirements are not already applicable, establish minimum distances between dynamic signs and regulations regarding the sequencing of sign messages to insure that drivers are not visually overloaded and reduce the chances of creating an over-stimulated driving environment. Minimum distances can be calibrated based on the driving environment, traffic, speed, and distance.

(ii) Decline to supplement federal and state standards to promote fairness and avoid creating additional incentives to race to apply dynamic technology to existing static signs.

(iii) Limit or prohibit dynamic signs at intersections, in demanding driving environments, and in places where they obstruct a driver's view.

(iv) Limit or prohibit dynamic signs that resemble traffic control devices.

G. Regulatory distinctions between on-site and off-site signs.

a. The safety implications of on-site and off-site signs: previous research does not indicate that on-site and off-site dynamic signs pose distinct safety risks that warrant differential regulatory treatment. However, because on-premises signs are more likely to serve wayfinding purposes, if on-premises signs are illegible or otherwise hard to see from a safe distance, there may be a risk that

they are seen too late by drivers who are trying to find their way to a particular location, and who then engage in dangerous maneuvers and lane-changes to leave the road. Local governments need not view advertising and wayfinding as equally important goals, and for that reason may choose to adopt policies that benefit the use of signage for wayfinding while burdening its use purely for advertising.

b. Regulatory goals and options: local governments may choose to regulate all dynamic signs equally, without regard to whether they on-site or off-site dynamic signs. Local governments may still choose to regulate on-site and off-site signs differently even if they do not regulate on-site and off-site dynamic signs differently.

H. Regulatory options for the size of signs.

a. The safety implications of sign size: previous research indicates that dynamic signs pose safety risks primarily by distracting drivers. The size of signs or the size of the dynamic portion of signs may be distracting because the size is too big or too small. If the size is too small, then drivers must take more time to read the sign, diverting their attention from driving tasks. In addition, advertisers have an interest in frequent message changes and using sequenced messages on small signs, features that increase driver distraction. If the sign is too big, the attention of drivers may be captured for lengthy periods of time, diverting their attention from driving tasks. Overly large signs are also more likely to obstruct a driver's ability to see other things, which may include important traffic-control devices and signs.

b. Regulatory goals and options: there is no standard approach to regulating the size of signs, and there is no standard approach to regulating the size of dynamic signs or the size of the dynamic portion of the sign. Size limitations may be established that reduce river distraction based on the driving environment in which the sign is located, distance, and legibility goals.

I. Regulatory options for the text size of dynamic signs.

a. The safety implications of text size

(i) Previous research indicates that the less legible the sign, the higher the likelihood of an increased crash rate. The preferred approach for highway signage is that sign text be 1 inch high to be readable from 30 feet away, and larger text is needed for signs to be legible at greater distances.

(ii) Sign associations have promulgated "best practices" standards for commercial on-premise signs, with a particular focus on legibility. Because there is generally a common interest between the sign industry and regulators in avoiding signage or text that is too small to be seen and understood in particular locations, those "best practices" standards can be a useful source of potential standards for text size in particular settings.

b. Regulatory goals and options: to increase legibility, reduce the time needed to read billboards, and reduce driver distraction, local governments can follow the preferred approach used for highway signage or calibrate the appropriate text size based on distance, the driving environment, and the desired legibility.

RESEARCH REVIEW OF POTENTIAL SAFETY EFFECTS OF ELECTRONIC BILLBOARDS ON DRIVER ATTENTION AND DISTRACTION

FINAL REPORT

September 11, 2001

Submitted to:

Office of Real Estate Services
and
Safety Core Business Unit
Federal Highway Administration

From:

Human Centered Systems Team
Office of Safety Research and Development
Federal Highway Administration

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction.		5. Report Date 6. Performing Organization Code
7. Author(s) J. Farbry, K. Wochinger, T. Shafer, N. Owens, and A. Nedzesky		8. Performing Organization Report No.
9. Performing Organization Name and Address Science Applications International Corporation 8301 Greensboro Drive McLean, VA 22102		10. Work Unit No. (TRAIS) 11. Contract or Grant No.
12. Sponsoring Agency Name and Address Federal Highway Administration Office of Real Estate Safety Core Business Unit 400 7th Street, SW Washington, DC 20590		13. Type of Report and Period Covered 14. Sponsoring Agency Code
15. Supplementary Notes COTR: Thomas Granda, HRDS and Lannie Graham HEPR.		

16. Abstract

This report is a research review of potential safety implications of electronic billboards (EBBs) on driving safety. The review covers the interval from a similar review published in 1980 to the present. The present review focuses on the safety aspects of EBBs and does not examine aesthetic issues. Included are a review of research on driver performance in the presence of EBBs and contacts with federal and state officials to describe state regulatory practices concerning EBBs. An account of tri-vision signs is a part of the state review. Knowledge gaps are identified based on the literature review and these gaps support the development of a set of research questions and related research findings. Research questions are divided into roadway characteristics such as curves, interchanges, and work zones; EBB characteristics such as exposure time, motion and legibility; and driver characteristics such as familiarity and age. Related research findings on the legibility of Changeable Message Signs (CMSs) are also included.

17. Key Word	18. Distribution Statement
Electronic Billboard, Tri-vision, Driving Safety, Driver Distraction, Advertising, Changeable Message Sign, Conspicuity, Legibility.	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
		43	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

Notice

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof. This report does not constitute a standard, specification, or regulation.

The United States Government does not endorse products or manufacturers. Trade and manufacturers' names appear in this report only because they are considered essential to the object of the document.

Table of Contents

1 INTRODUCTION 3
1.1 Background and Objectives 3
1.2 Structure of the Report 3

2 LITERATURE REVIEW 4
2.1 Types of Electronic Billboards 4
2.2 State Regulations and Policies on Electronic Billboards 5
2.2.1 Introduction 5
2.2.2 Sources of Information 5
2.2.3 State Regulations and Practices 6
2.2.4 National Alliance of Highway Beautification Agencies 7
2.2.5 State Outdoor Advertising Regulations 8
2.2.6 Concerns about Electronic Billboards 8
2.3 Reports on Billboards and Safety 8
2.3.1 The Wachtel and Netherton Report 8
2.3.2 Wisconsin DOT Report 9
2.3.3 The Curriden Article 10
2.4 Potential Safety Factors 10
2.4.1 Distraction 10
2.4.2 Conspicuity of Displays 11
2.4.3 Legibility 13
2.5 The Driver 15
2.5.1 Driver Age 15
2.5.2 Driver Familiarity with Route 17
2.6 Measures of Effectiveness 17
2.6.1 Surrogates 17
2.6.2 Current Measurement of Distraction 18

3 SYNTHESIS 20

4 RESEARCH NEEDS 21
4.1 Roadway Characteristics 21
4.2 EBB and Tri-vision Sign Characteristics 23
4.3 Research Findings in Legibility 25
4.4 Driver Characteristics 28
4.5 Other Potential Driver Distractions 29
4.6 Future Research 29
4.7 Research Methods 30

5 ANNOTATED BIBLIOGRAPHY 31

REFERENCES 41

LIST OF TABLES

Table 1. Timing Boundaries of Several Tri-Vision Billboard Policies..... 7
Table 2. Recommended Minimum Luminance Values (cd/m2) for CMS Visibility..... 26

EXECUTIVE SUMMARY

Advances in display technology and decreases in cost have created interest to expand the deployment of high resolution and dynamic imaging. The introduction of such technology to billboards, where static displays of advertising have been the standard, raises questions on the effects that electronic billboards (EBBs) may have on drivers' attention.

The Office of Real Estate Services and the Safety Core Business Unit in the Federal Highway Administration (FHWA) requested the FHWA Office of Safety, Research and Development to review literature related to the safety implications of EBBs, present findings, and recommend a research plan to address knowledge gaps. This project follows earlier work sponsored by the FHWA in 1980 and compliments driver distraction studies relative to in-vehicle displays currently underway.

Based on conversations with government staff and examination of state regulations, the literature review summarized state billboard regulations and policies relevant to EBBs and tri-vision signs. The review then encompassed billboard-related crash analyses and potential safety factors such as distraction, conspicuity, and legibility. Due to the limited amount of research regarding external distraction in drivers, internal distractions, such as in-vehicle information systems and cellular telephones, were used as surrogates when investigating how potential distractions affect the driver.

As the literature review identified and summarized potential safety effects of EBBs and tri-vision signs, many questions became evident. The synthesis section organized these questions into knowledge gaps. The identified knowledge gaps have been categorized into the areas of roadway geometry characteristics, EBB and tri-vision sign characteristics, and driver characteristics.

Since this effort was purely a review of existing literature, no formal research was completed; the purpose of the remainder of the research review was to build upon the identified knowledge gaps. Each of the gaps was analyzed and preliminary research plans were proposed. Included in each plan are associated goals and proposed research questions. When possible, relevant research findings in which the research questions were based upon were identified.

Roadway characteristics that were recognized for future research in the knowledge gap section include horizontal and vertical curves, intersections, work zones, and EBB billboard spacing. EBBs and tri-vision sign characteristics and their proposed research questions are related to an EBB's message content and comprehensibility, exposure time, motion, and sign maintenance. Finally, research questions related to driver characteristics are directed to age and route familiarity.

1 INTRODUCTION

1.1 Background and Objectives

Advances in outdoor display technology, and decreases in cost, support an interest in expanding deployment of high resolution and dynamic imaging in outdoor advertising. This raises questions on the effects that electronic billboards (EBBs) and other dynamic signs such as tri-vision signs may have on driver distraction. The purpose of this report is to present a review of the literature on the safety implications of electronic billboards, to identify knowledge gaps in the findings of the review, and to develop a research plan to address the knowledge gaps.

The Office of Real Estate Services (ORES) and the Safety Core Business Unit in the Federal Highway Administration (FHWA) requested the FHWA Office of Safety, Research and Development to review literature related to safety implications of EBBs, present findings, and recommend a research plan to address knowledge gaps. The scope of this review was limited to safety issues. This project follows an earlier work sponsored by the FHWA in 1980 and complements studies of in-vehicle driver distraction currently underway.

The general approach in the present review was to identify information about potential safety implications of EBBs. Factual data regarding billboard safety were sought through a review of existing research literature and information obtained from government staff. Because driver distraction is of interest in other areas of research, such as cellular telephone use and in-vehicle visual information equipment, the present report examines these areas for possible cross-fertilization results. The report concludes with a set of research questions and research findings that are directed to the safe design of dynamic billboards.

1.2 Structure of the Report

The Literature Review in Section 2 defines EBBs and tri-vision signs, provides a survey of state practices, and reviews research on EBBs and related distraction research. The Synthesis in Section 3 provides a list of knowledge gaps that were identified in the literature review. Section 4 proposes research in the format of research questions and presents related research findings that are directed to understanding driver behavior in the presence of EBBs and tri-vision signs. The report also contains an annotated bibliography and appendices.

2 LITERATURE REVIEW

The literature review researched two types of information to understand the safety implications of electronic billboards. One research effort examined current state practices in the regulation of EBBs to determine, for example, the features of those displays at which the regulation is directed and the consistency of regulation among the states. The other type of information was derived mostly from research studies that had the objective of understanding driver behavior in the presence of electronic billboards and/or tri-vision signs. Information of the latter type can provide a source for informed state planning.

The review begins with a description of electronic billboards, tri-vision signs, and a discussion of the relationship of these two display types to changeable message signs used for transmitting roadway status information. The next section describes the results of the review of current state practices on billboard regulation and this is followed by the review of research studies.

2.1 Types of Electronic Billboards

Technology has advanced sufficiently for billboards to provide dynamic and realistic views much like color television. The advanced EBB has the capability to present multiple views and objects that have realistic motion. In contrast, tri-vision signs provide one of three views with rotating cylinders and generate mechanical motion or movement. Since both the EBB and tri-vision sign incorporate components that display motion, some of the issues associated with EBBs are also associated with tri-vision signs. These two types will be compared in functional terms.

For the purpose of the present report, the definition of an EBB is a programmable display that has the capability to present a large amount of text and/or symbolic imagery. Some EBBs present images in realistic motion and in a large variety of colors. The tri-vision sign is defined as a display device capable of presenting three separate images sequentially by rotating triangular cylinders. Appendix A shows examples of EBBs and a tri-vision sign.

The EBB consists of several visual characteristics. EBBs present high-resolution color images, complex visual arrangements, rich variation in color, and a vast amount of images. Operational characteristics include electric power and remote control though a computer terminal. The EBB screen display elements are typically arranged in a matrix. The shape of the EBB is usually rectangular, but irregular shapes are possible. An example is the EBB on the NASDAQ Marketsite's Tower in New York City's Times Square. This EEB wraps around the corner of the building.[1] The NASDAQ video screen is eight stories high and covers 10,736 square ft with light-emitting diodes (LEDs).

The EBB can vary in complexity. Whereas some EBBs display motion, fine detail, and a rich variety of color, other EBBs provide a simpler image. This image is often composed of a short sequence of words in which each letter is defined by a small number of matrix elements such as a 4x6 matrix or a 5x7 matrix. The elements are typically light emitting (i.e., LEDs or incandescent) and presented against a dark background. This simpler version of the EBB shares features of the display used by governmental agencies for presenting information to drivers. This display is referred to as a changeable message sign (CMS) in this paper. The CMS typically employs a matrix technology to provide variable messages displays. Other equivalent terms currently used for this sign are variable message sign (VMS) and, to a lesser extent, dynamic message sign (DMS). The permanent CMS is found mounted above the roadway whereas a portable CMS is usually mobile and is located on the shoulder of the roadway.

Whereas the EBB can display a vast number of images, the tri-vision sign is more limited. The typical tri-vision sign is composed of a series of vertical or horizontal cylinders each of which has a triangular cross section. Each partial rotation of the group of triangular cylinders produces a different image. A single tri-vision sign typically displays, at any given time, one of three images. Although the final composite image does not provide motion, there is still movement due to the transition from one image to another as the cylinders rotate. This movement can act as an attention-getting feature that attracts the driver's attention to the display. One such feature present during the rotation is the partial viewing of two images in transition, where one image advances as the other retreats. Another feature is the change in reflective qualities among the different sides of the triangular cylinders during the transition.

2.2 State Regulations and Policies on Electronic Billboards

2.2.1 Introduction

This section of the literature review pertains to the regulation of EBBs across the United States. A review of existing states' regulations and policies is presented first since it is believed that this will provide the reader with an understanding of how EBBs fit into various states' outdoor advertising policies. Each state's regulations generally derive from the 1965 Highway Beautification Act (HBA). A detailed history and overview of the federal outdoor advertising control program, which includes the HBA, can be found on the FHWA's ORES web site: http://www.fhwa.dot.gov/realestate/oacprog.htm. A review of state outdoor advertising regulations revealed that common billboard guidelines governing EBBs and tri-vision signs do not exist. While states generally have consistent regulations governing static billboards, regulations covering EBBs and tri-vision signs vary widely. Implementation practices differ significantly from state to state. A broad spectrum of regulations exists, ranging from lenient control to the prohibition of outdoor advertising.

2.2.2 Sources of Information

Federal and state Department of Transportation (DOT) personnel provided information regarding state regulations and policies. The information pertained to whether states regulate EBBs, and if so, in what manner. The sources of information are described briefly as follows:

- State Outdoor Advertising Regulations. Efforts were made to obtain the most current billboard regulations nationwide. These regulations were collected from various sources, such as the state DOT directly, a state's website, or from the National Alliance of Highway Beautification Agencies' (NAHBA) website. Overall, regulations were obtained from 44 states.
- Personal Communication. In addition to obtaining state documents, the researchers contacted states and FHWA division offices. Since a supporting contractor was to be directly contacting state DOTs, an introductory e-mail message was sent from FHWA Headquarters to each Division Office to notify the FHWA Division Office and the state DOTs of the contractor's role. The FHWA contractor contacted state personnel who were knowledgeable of their state's billboard regulations. The telephone calls were of an unstructured nature, and their purpose was to determine if local constituents had submitted comments or complaints about EBBs, and if research had been conducted on EBBs in the state.

FHWA Division Offices. Nine FHWA Division Offices were contacted. FHWA's ORES recommended some of the selected Division Offices and others were selected randomly.

State DOTs. Some state DOT personnel were contacted at the suggestion of their local FHWA Division Office while other states were selected randomly. Ten state DOTs were contacted by telephone.

National Alliance of Highway Beautification Agencies (NAHBA). In the early 1990s, a group of individuals responsible for directing or managing their state's outdoor advertising program formed the NAHBA. The Alliance meets regularly to discuss new developments in technology, upcoming legislation, and ways to improve or stream-line regulation of outdoor advertising, junkyards, landscaping, and visitor centers. Additionally, NAHBA maintains a website that contains outdoor advertising regulations of numerous states and the federal government.

A NAHBA meeting was held in Washington, D.C., in late January 2001. Two members of the research team and their FHWA contracting officer technical representative met with NAHBA members after the formal meeting had ended. Representatives of Florida, Kentucky, Missouri, Oklahoma, and Utah were present. The meeting served a purpose similar to the telephone calls, except that it allowed a more interactive conversation in more detail.

NAHBA provided the responses from an informal email questionnaire pertaining to EBBs and a tri-vision sign survey to the research team. These are presented in a subsequent section of this report.

2.2.3 State Regulations and Practices

In a July 1996 memorandum to FHWA Regional Administrators, the ORES provided additional interpretation of advertising technology to the individual states regarding off-premise changeable message signs. An off-premise sign is a sign that disseminates information that **does not** directly relate to the use of the property on which the sign is located. ("Changeable message signs are acceptable for off-premise signs regardless of the type of technology used, if the interpretation of the State/Federal agreement allows such signs," page 1, paragraph 2, sentence 4 of the memorandum).

In a July 1998 memorandum, the ORES reaffirmed their policy that off-premise signs using animated or scrolling displays that are dependent on flashing, intermittent, or moving lights were not conforming signs. This decision was made after careful review of a videotape showing the full-motion EBB erected in Scottsbluff, Nebraska. It was concluded that such signs raise "significant highway safety questions because of the potential to be extremely bright, rapidly changing, and distracting to motorists," (page 1, paragraph 4, sentence 1 of the memorandum).

A majority of states have a policy regarding the lighting of billboards, and through this policy, states regulate EBBs. While common themes are present in most lighting regulations, each state's laws have unique wording. As an example, the Arkansas State Highway and Transportation Department's Outdoor Advertising Policy,[2] Regulations for Control of Outdoor Advertising on Arkansas Highways, as authorized by Arkansas Act 640 of 1967 and Highway Commission Minute Order No. 77-6, section III, subsection D, Lighting states:

A. Lighting Signs may be illuminated, subject to the following restrictions:

1. Signs, which contain, include, or are illuminated by any flashing, intermittent, or moving light or lights are prohibited, except those giving public service information such as time, date, temperature, weather, or similar information.
2. Signs which are not effectively shielded as to prevent beams or rays of light from being directed at any portion of the traveled ways of the Interstate or Primary highways and which are of such intensity or brilliance as to cause glare or to impair the vision of the driver of any motor vehicle, or which otherwise interferes with any driver's operation of a motor vehicle are prohibited.
3. No sign shall be so illuminated that it interferes with the effectiveness of, or obscures an official traffic sign, device, or signal.

2.2.4 National Alliance of Highway Beautification Agencies

Tri-vision Sign Survey. A 1999 survey sponsored by and presented at the annual NAHBA conference reviewed the tri-vision sign advertising regulations of every state and Washington, DC. The following results show that a majority of states are addressing current advertising technologies in their outdoor advertising regulations. At the time of the survey:

- Nine states had specific regulations governing signs,
- Nine states had regulations on tri-vision signs that were either being drafted or in pending legislation,
- Fifteen states had regulations regarding moving parts and/or lights,
- Nine state had no regulations on tri-vision sign, and
- Six states as well as Washington, DC, prohibited tri-vision signs.

Table 1 provides a summary of tri-vision sign exposure dwell times and transition times that were presented in the 1999 NAHBA survey.

Table 1. Timing Boundaries of Several Tri-Vision Sign Policies.

Timing Boundaries	Average	Maximum	Minimum
Minimum Exposure Dwell Time (sec) [1]	7.32	10	4
Maximum Transition Twirl Time (sec) [2]	2.16	4	1

Source: NAHBA 1999 Conference.

[1] *Minimum Exposure Dwell Time:* For billboards that change messages, (e.g., tri-vision sign or CMSs), the exposure time can be defined as the minimum amount of time, in seconds, that a message must be shown. Some minimum exposure times have been derived from analytical calculations (based on speed limit and the number of faces of a billboard that can be seen) while other minimum exposure times have come in the form of recommendations from outdoor advertising suppliers or have been based upon engineering judgment.

[2] *Maximum Transition Twirl Time:* The transition time is the amount of time, in seconds, that is required for a billboard (such as and EBB or tri-vision sign) to automatically change messages. Many states have set a maximum transition time for this change. The maximum was originally determined by taking into account the mechanical constraints of older tri-vision signs and attempting to limit the amount of visual distraction caused by a sign's transition. Due to advances in technology, transitions executed by a full-motion video billboard are virtually instantaneous.

Electronic Sign Data. In early February 2001, NAHBA asked its membership to answer four questions regarding EBBs. One question relevant to this research is: "Do you have a definition

of an electronic sign?" Of the 20 responses that were received, five states had a definition, 14 did not have a definition, and one state was in the process of rewriting its definition.

2.2.5 State Outdoor Advertising Regulations

A review of statutes was conducted to identify state prohibitions on specific characteristics of signs. This review is presented in Appendices B and C. The results indicate, in part, that of 42 states:

- Thirty-six states had prohibitions on signs with red, flashing, intermittent, or moving lights,
- Twenty-nine states prohibited signs that were so illuminated as to obscure or interfere with traffic control devices, and
- Twenty-nine states prohibited signs located on interstate or primary highway outside of the zoning authority of incorporated cities within 500 ft of an interchange or intersection at grade or safety roadside area.

Additional information on other sign characteristics includes insufficient shielding of light, timing limits, and sign location relative to traffic control devices.

2.2.6 Concerns about Electronic Billboards

Numerous states have attempted to identify a relationship between EBBs and safety by using traffic conditions as a surrogate measure. The states of Nevada, Utah, Texas, New York, New Hampshire, and Massachusetts reported no evidence of increased traffic safety problems after the installation of electronic information displays in their city centers and along their highways. Additionally, five state DOT personnel were asked if a crash relationship with EBBs existed in their states; the responses were that a relationship between crashes and EBBs was not identifiable. However, one belief is that EBBs are typically on congested roadways where drivers have time to look at the sign, so it is difficult to determine if the EBBs cause crashes, let alone traffic congestion.

2.3 Reports on Billboards and Safety

Determining the effect of roadway commercial advertising billboards on safety is a difficult endeavor for several theoretical and methodological reasons. First, crash frequency is often used as a measure of safety, yet crashes occur relatively infrequently, so changes in frequency may be subtle and are not easily attributed to particular factors. In addition, distraction effects may interact with other factors, such as weather. Furthermore, crash reporting procedures differ across jurisdictions and may not refer to billboard distraction as a factor in the crash. Additionally, drivers may be unlikely to identify distraction as the cause of a crash for liability reasons. Regardless of these difficulties, researchers have examined the effects of billboards on safety. The results are mixed and inconclusive, as shown below.

2.3.1 The Wachtel and Netherton Report

The safety and aesthetics of commercial electronic variable message signing were reviewed by the FHWA in 1980[3] and are summarized below. Part of that effort included a review of published studies on the safety effect of roadside advertising signs, including several field and

laboratory studies from 1951 to 1978 on non-electronic advertising billboards, and one analysis in 1976 of an electronic advertising sign in Boston.

The Minnesota Department of Highways concluded from a field study in 1951 that an increase in commercial billboards would result in an increased crash rate. A 1951 field study conducted by Iowa State College concluded that more crashes caused by driver inattention occurred on road segments that contained billboards. The Michigan State Highway Department in 1952 found that advertising signs did not correlate with the roadway's crash experience, except for illuminated (neon) signs, which did correlate with an increased crash rate. A 1961 study of California Route 40 concluded that road segments with billboards experienced significantly more crashes than segments without billboards. A 1967 field study compared the crash history of three locations in Chicago before and after the installation of three illuminated, commercial changeable message signs. Crash rates did not change at two of the sign locations, but the third sign location showed an increase of crashes. The third sign had alternating lights, showed several advertising messages, and was illuminated by bright white lights. The rapid increase in crashes led state highway officials to request that blue lights replace the white lights.[3]

The Tele-Spot sign in Boston was an off-premise commercial electronic sign. The sign was visible from the Central Artery in the midst of complex on- and off-ramps, regulatory signs, and guide signing. The Massachusetts Outdoor Advertising Board conducted an analysis of traffic crashes three years before and two and a quarter years after sign installation. The analysis showed an overall reduction in the Average Daily Traffic (ADT) and crashes along the expressway, but on the areas of the expressway from where the Tele-Spot was visible, the crash reduction was 10 percent less than the overall reduction. The Board regarded the 10-percent difference as an indication that the Tele-Spot sign was a distraction and a safety risk, and consequently revoked the license for the sign.[3]

2.3.2 Wisconsin DOT Report

The Wisconsin DOT examined the crash rates on Interstate 94 eastbound and westbound adjacent to the Milwaukee County Stadium[4]. The analysis compared the crash rates three years before and three years after the installation of a variable message advertising sign. The sign, installed April 13, 1984, displayed sporting scores and advertisements, and changed images an average of 12 frames per minute. The purpose of the comparison was to assess whether the presence of the sign correlated with a change in the crash history of I-94. To determine crash rate, the Wisconsin DOT inventoried crashes that occurred on the segment on I-94 from where the sign was visible, categorized them into side-swipe and rear-end crashes, and determined the ADT from an automatic traffic recorder. The crash rate was derived from the equation:

$$\text{crash rate per million vehicle miles} = \text{crash frequency}/(\text{length of segment}) * \text{ADT} * 10^6)$$

Eastbound Segment. The crash rate for the three years before installation was 3.12 crashes per million vehicle miles traveled (VMT). The three-year crash rate after installation was 4.25 crashes per million VMT. The increase in crash rate after installation was 1.13 crashes per million VMT, or 36 percent. Specifically, the rate of increase for sideswipe crashes was 8 percent, and the rate of increase was 21 percent for rear-end crashes.

Westbound Segment. The crash rate before installation was 2.91 crashes per million VMT, and 3.53 per million VMT after installation, an increase of 0.62 crashes per million VMT or 21 percent. The rate of increase was 35 percent for both sideswipe crashes and rear-end crashes.

The Wisconsin DOT concluded from its analysis that the variable message sign had an effect on traffic safety, notably an increase in the rate of sideswipe crashes. In addition, the report concluded that the greater increase in crashes for the eastbound segment was due to the orientation of the sign towards eastbound traffic. (This sign was removed 16 years after it had been installed, when the Milwaukee County Stadium was demolished. A similar sign was installed on the new stadium.)

2.3.3 The Curriden Article

A recent court case in Texas arose from a crash in an airport caused by a driver reading an electronic sign that listed departure and arrival times, and gate information. The driver stopped his vehicle to read information on the sign. A second vehicle swerved around the stopped vehicle and side swiped a vehicle in the adjacent lane, resulting in a three-vehicle crash. Two drivers were injured in the crash and sued the airline that owned the EBB. A jury found that the EBB was the indirect cause of a multiple vehicle crash at the airport and returned a negligence verdict against the airline. The airport subsequently removed the EBB.[5]

2.4 Potential Safety Factors

2.4.1 Distraction

The review of crashes presented previously suggests that EBBs may be associated with a higher crash rate under certain conditions. If this possibility is verified through further research, then it can be asked whether these crashes are a result of driver distraction in which the distracting stimulus is the EBB.

Distraction can be a framework in which to view EBBs and safety. The safety consequences of distraction from the driving task can be profound. Treat et al.[6] found that driver inattention and improper lookout increase the likelihood of crash occurrence and are major factors underlying the causes of crashes. According to Wang, et al.,[7] an analysis conducted by the National Highway Traffic Safety Administration (NHTSA) of causal factors of crashes showed that distraction by sources external to the vehicle accounted for 3.2 percent of the crashes. The external sources included people, events, and non-specified objects. The NHTSA analysis did not identify the external objects, nor did it identify billboards as among the sources of distraction. However, the data suggest that, on occasion, external stimuli can be sufficiently distracting to drivers, causing or resulting in a crash.

Distracting Stimuli. One type of distracting stimulus is the unexpected event that results in an involuntary reaction. This type of stimulus is unanticipated and produces a surprise or orienting response – the person will redirect his or her attention to the new event to identify it and assess its significance. Such a stimulus may be an event that is not typical for that time or place, e.g., a flash of light, movement or sound.

A more subtle form of distracting stimulus can be one in which the stimulus has a less surprising quality, and thus presents more time for the driver to decide whether to attend to the stimulus and how much attention to direct to the stimulus. Dorneim[8] documented that this has been has been

a problem for pilots. In some situations, a pilot will occasionally attend more to a secondary task and neglect the primary task of flying the plane, sometimes resulting in a crash. Although the task of flying is obviously different from driving, there may be lessons to be learned for drivers. NASA is currently conducting research on ways to avoid this type of air crash. It may prove useful to check the progress of this research to see whether NASA research results have implications for driver distraction. Some of the research questions involve understanding how people know when to return their attention to a task, as well as identifying the limits of switching between tasks.

Measures of Distraction. For this project, driver distraction is characterized as deterioration in driving performance, the primary task, while attending to a second, non-driving task. The second task is subordinate to the driving task. An example of a non-driving task is operating an audiocassette system or using a cellular telephone. When the safe operation of the vehicle is degraded by the performance of the second task, the second task is defined as a "distractor."

Safe operation or control of the vehicle is recorded with measures of effectiveness (MOE) for driving. These measures include lateral deviation of the vehicle and maintenance of appropriate speed, as indicated by headway measures. Lack of control indicated by excessive lateral deviation or inappropriate speed could result from distraction, sleepiness, inability to see the road because of weather or lighting, poor perception of road geometry requirements, or other reasons. Since there are multiple factors that can contribute to lack of vehicle control, the design of a distraction study must take into account these other factors and ensure that they do not confound the design and allow misinterpretation of the data.

Lateral deviation can be measured by analysis of variability in steering wheel position, and/or varying distance of the vehicle from a lane marking on the road. When measuring lateral deviation, a certain amount of variability in deviation is expected. Greater-than-normal lateral variation may indicate a degree of lack of vehicle control. An example of lateral deviation occurs during the performance of a non-driving task such as the selection, orientation, and insertion of an audiocassette into the cassette player while performing the primary task of negotiating a curve. If the cassette operation is performed in the same manner and at the same rate as when the vehicle is motionless, there is a high likelihood of lateral deviation. This scenario of cassette operation would be an example of a distracting task.

Another measure of safe vehicle control is the maintenance of appropriate speed. One driving behavior that would lead to improper speed is the selection of a more or less constant speed (speed invariance) when nearby vehicles change speed. This could result in an unsafe headway condition. Lack of safe control due to improper speed selection could be due to reasons similar to those listed above for lateral deviation. Another behavior measured by speed is the slowing of a vehicle to view an item external to the vehicle. Braking for emergencies may also be considered for a measure of distraction.

2.4.2 *Conspicuity of Displays*

To what degree does an external, conspicuous stimulus unrelated to driving distract a driver from the driving task? This question is basic to the notion that a billboard may degrade driving performance by diverting attention away from the driving task. If a billboard degrades driving performance, it may be useful to identify the components of the billboard that can distract drivers. Some possible distracting components of a display are motion, complexity, and

illumination. If such qualities are relevant to distraction, do they act alone or do they interact with each other? To the extent that these qualities are identifiable, it may be possible to understand their effect on distraction.

A brief review conducted by Hughes and Cole[9] identified the physical properties of a conspicuous object. Important properties that contribute to conspicuity include object size, object contrast with its immediate background as well as the complexity of the background. An additional property is "the boldness of the graphics used to display a message."

According to Cole and Hughes,[10] conspicuity consists of two types: attention conspicuity and search conspicuity. Attention conspicuity is the "...capacity of an object to attract attention, and...might be measured by the probability of the object being noticed when the observer has not had his or her attention directed to its likely occurrence." Search conspicuity is "... the property of an object that enables it to be quickly and reliably located by search." Cole and Hughes suggest that eye movement that is responding to a stimulus in the peripheral visual field can be used to infer attention conspicuity in the visual mode. Such movement may be a "quasi-reflex eye movement that is related to human defense reaction."[10]

Theeuwes[11] challenged the view that conspicuous objects attract attention automatically. Instead, drivers will attend to the driving task and not a distractor. His past research showed that subjects ignored salient objects that were irrelevant to a search task. In a subsequent study, participants were instructed to locate a task-related stimulus (a blue sign) in a video taken from the driver's perspective. Distracting stimuli (e.g., a pedestrian in an orange jacket) were present in some experimental conditions, but not others. The results indicated that when the target stimulus, or blue sign, was in an expected location, the presence of the distractor had no impact. However, when the target was in an unexpected location, thus increasing the search time, the presence of the distractor increased the time required to locate the target above that due to expectation effects.

The visual environment affects the conspicuity of objects. Since drivers obtain travel related information by searching the visual environment for a target, such as a street sign, outdoor advertising can compete with targets of driving-related information. The concept of "visual noise" refers to non-target objects in an environment and can be used to determine a sign's conspicuity in a particular environment. Akagi et al.[12] state that "Objects causing visual noise can be defined as objects that hinder drivers' field of view, such as billboards and buildings along roadsides." This study reported that increases in the visual noise (i.e., the number of signs in a roadway location) correlated with longer search time required for drivers to locate a target sign.

In a study performed by Hughes and Cole[9] regarding the conspicuity of roadside objects, drivers reported "all the objects or things that attracted their attention" as they drove through 20 km of residential streets and arterial roads. Afterwards, they observed a film of the same route, taken from the driver viewpoint. Advertising displays accounted for 13.7 percent of reports in the driving study and 10.2 percent in the laboratory study. Driving related objects (road, traffic control devices (TCDs), vehicles, and people) accounted for 51.4 percent of reports in the driving task and 57.9 percent in the laboratory study. Other non-driving task elements included immediate and general roadway surroundings. Advertising elements were reported equally on arterial and shopping center routes, and more so than on residential streets. However, in

residential streets, drivers directed more attention to non-driving related elements. This suggested a possible spare attention capacity.

A field study by Luoma[13] analyzed driver eye fixations on roadside advertisements during a 50 km drive in Finland. Results indicated that accurate perception of advertisements was associated with longer fixation times (2.3 sec) than the times for pedestrian markings and speed limit signs (0.4 sec to 0.5 sec). The author concluded, "...long fixation times indicate that the characteristics of roadside advertisements related to information ergonomics are poor."[13] Information ergonomics is the practice of providing information in the most efficient way, such that viewers can access the information quickly and clearly.

Roadway Context. Determining whether billboards influence driver behavior would require understanding the roadway context of a billboard. For example, roadway factors such as the angular distance of a billboard, billboard placement and volume characteristics of an intersection, may influence driver responsiveness to visual stimuli and the experience of workload. In this sense, information on the effect of the roadway context on driving performance should assist in defining appropriate billboard locations. Research on driver search behavior in high and low volume intersections by Rahimi, Briggs and Thorn[14] in 1990, suggests that higher volumes of traffic affect driver eye and head movements. The research indicates that the greater visual complexity associated with the high volume intersection required drivers to search the environment *more* than in the low volume intersections. It can be conjectured that additional visual stimuli, such as billboards, may add additional demand to driver workload in high-volume intersections.

2.4.3 Legibility

One event that can be considered a distraction occurs when a driver passes a sign where the text has poor legibility. The weakness in legibility may be due to poor character font design, improper spacing of letters, or other factors. However, if the information is of sufficient interest, the driver may try to read all of the text anyway. Such a decision could take time away from the driving task thus increasing crash risk. If on the other hand, the sign had text that met legibility standards, less effort would be required to read the sign. Although this situation is a more subtle distraction than that due to perceived motion in a sign, it still could present potential for crash risk. Legibility information is available for CMSs. Although the CMS is restricted to providing roadway related information, its legibility requirements may be relevant to the design of the simpler EBB

Luminance and Luminous Contrast. Garvey and Mace[15] examined CMSs to identify the features that contribute to their visibility. Both field and laboratory studies were employed following a review of the literature. Of particular interest in this report are the requirements for lighting, such as the luminance value and contrast ratio necessary for legible viewing. The study discussed requirements for displays such as LEDs, fiber optics, lamps, flip discs, and reflective discs. The authors provide guidelines that are aimed at improving the visibility of all CMSs, regardless of technology.

Minimum luminance values were recommended for CMS visibility. These values are based on the 85th percentile driver accommodated at 198 m (650 ft). Age and position of the sun were two of the most significant factors when determining minimum luminance. Values are presented for drivers in two age ranges (16-40 and 65 or older). When the CMS is backlit (sun behind and

above CMS) or under washout conditions (low sun shining directly on CMS), 1000 cd/m^2 is recommended for both age groups. This value accommodates less than 50 percent of older drivers at any luminance level with extreme sun angles. When the sun is directly behind the CMS, few if any people will be able to read the characters under any luminance level. When the sun is overhead the 65 years and over group still requires 1000 cd/m^2, but only 850 cd/m^2 are required for the younger group. During overcast or rain, 600 cd/m^2 is required for the older group and 350 cd/m^2 for the younger. For the nighttime condition, both groups require a luminance of 30 cd/m^2.

According to Garvey and Mace,[15] there should be a minimum luminous contrast between the unlighted and lighted elements on a CMS; a maximum luminous contrast was not provided. Contrast orientation should always be *positive*, that is, the characters should be lighted against a dark or less luminous background. A negative contrast is likely to result in a 25 percent shorter legibility distance.

Contrast luminance for a CMS was determined with the formula:

$$\frac{L_t - L_b}{L_b}$$

where:

L_t = luminance of a character module with all of the elements "on"

L_b = luminance of a character module with all of the elements "off."

The minimum acceptable contrast luminance is 5, and the optimal contrast luminance varies from 5 to 50.

A summary of existing literature on sign visibility performed by Kuhn, Garvey and Pietrucha,[16] examined the two main research areas of sign detection; that is, sign conspicuity and sign legibility. The emphasis was on the more familiar and traditional sign rather than electronic signs. It is likely, however, that the design of an electronic sign would benefit from some of this information. A series of visibility guidelines for on-premise signs was presented. (An on-premise sign disseminates information that directly relates to the use of the property on which it is located.) Later research by Kuhn[17] compared lighting methods (external illumination, internal illumination with opaque background, internal illumination with translucent background and neon) under day and night conditions to examine sign visibility features.

Claus and Claus[18] addressed the issue of startling types of signs, such as those employing "flashing or animation to catch attention." These authors discuss different types of motion or movement. One of these is "…jumping arrows, or rapidly chasing or flashing lamp borders… (that) should perhaps be limited to midways and to rows of theater marquees." They did allow for other pictorial sequences that may be more acceptable as well as alternating displays such as the time and temperature display.

Alphanumeric Characters and Their Spacing. The design or selection of font type and the spacing between characters (letters), words and sentences are critical in achieving effective legibility of signs, especially when legibility is defined by the distance at which a sign can be read. Garvey & Mace[15] provided draft guidelines for the design of the elements and characters that compose a word and word groupings on a CMS, in which the character font is composed of

light emitting elements. To achieve effective legibility, a number of features are considered. It is important to address each of the features, since they interact with each other. For example, to design an upper case character font, use a 5 x 7 matrix of light emitting elements. However, with a small matrix of this size, it is well to avoid thickening of a line in a character (e.g., as in an "I" or "T") by adding another row or column of elements because the legibility distance is shortened by about 25 percent.

Font design for exterior signs should be simple without serifs. Additional information was provided on the height of the character, the proportion of the character or width-to-height ratio, and stroke width of the character. Further information was provided on the spacing between letters, between words and between lines of characters. Signs with light emitting elements have special characteristics. Light emitting elements provide high contrast between characters and background and thus provide superior performance over reflective signs at night. However, the light intensity requires careful adjustment. According to Garvey and Mace,[15] high contrast produced by lighted elements at night can "create halation or irradiation, blurring letters with wide stroke widths."

Message Length. A series of studies was performed by McNees and Messer[19] to evaluate urban freeway guide signing. A study relevant to EBB issues examined the reading time required for guide signs. Study variables included "bits" (i.e., the amount of information on each panel) and number of sign panels. A typical sign panel contained an exit number, exit direction, cardinal direction, route number, and two destinations. It also included symbols such as a shield, and directional arrows. Examples of bits of information were: "I-395," "Washington, D.C." and "South." Each sign panel had, on average, six bits of information. The display time of the sign simulated the total time a driver would have available to read a guide sign in a typical freeway environment. The display times provided for reading the signs represented three traffic conditions: "extreme" (2.5 sec display time), "minimum" (4 sec display time), and "desirable" (6 sec display time). Median reading times for these conditions were: 1.7 sec (extreme), 2.0 sec (minimum), and 2.9 sec (desirable). The results indicated that the time used to read the signs was dependent on quantity of information per sign as well as time available to perform the task. Based on these results, the authors concluded that the information content of a highway guide sign should not exceed six bits of information per panel.

2.5 The Driver

2.5.1 Driver Age

The analysis of distraction should consider the effect of driver age. If a significant portion of the driving population is more susceptible to distraction, then research on the relationship between distraction and safety should recognize this susceptibility. Such research could provide information about age-related differences regarding visual capability or reaction times that are relevant to driver reaction to EBBs. Both older drivers and young/inexperienced drivers are examined in this discussion.

The highway safety community recognizes that the probability of crash involvement varies with driver characteristics, most notably age. Highway data analysis demonstrates that the young driver and older driver populations have high crash involvement, and elevated injury and fatality rates. According to the Transportation Research Board's Special Report Number 229,[20] the high involvement rate of older drivers in crashes is second only to the rates of young drivers

Experience and age *may* be important factors to consider in the evaluation of the effects EBBs have on safety. The research literature provides a firm foundation for stating that age and experience need to be considered. If EBBs are ultimately found to have a high degree of attention conspicuity – that they compel drivers to attend to them – then it is reasonable to expect that populations such as older or inexperienced drivers, who have less attention to spare, will be placed at greater risk by EBBs.

The Older Driver. According to Barr and Eberhard,[21] the safety and mobility of older drivers, generally defined as 65 years of age and above, are highly relevant to transportation planning. Because of an increasingly aged population, the number and proportion of older drivers are rising. By 2020, Waller[22] has estimated that 17 percent (50 million people) of the United States population will consist of people 65 years and older, compared to 12 percent in 1988. The proportion of older adults licensed to drive is increasing. For example, in 1980, 60 percent of older adults (at least age 65) were licensed drivers, compared to 70 percent in 1989. These data point to the need to include older drivers in research programs on roadway safety, including the evaluation of EBBs and distraction.

Older drivers have a high crash risk per mile.[22] They are involved in a disproportionate number of fatal crashes and multi-vehicle crashes where they were the responsible party,[23, 24] and are over-represented in crashes that involve turns, merges, and yielding the right of way.[25]

Recent studies performed by Ball and Owsley[26] point to cognitive demands as influential factors in driving. Visual processing speed and the ability to handle selective and divided attention demands may have the greatest impact on crash rates. An increase in age did not directly contribute to crash involvement. However, an increase in age correlated with lower processing speed and decreased attention. The fact that attention and visual processing speed degrade with age may be symptomatic of the increasing inability of older drivers to encode and process all but the most important information in the driving environment.

The Younger Driver. The young driver (16 to 24 years old) is more likely to be involved in a crash than drivers of other ages, and a driver under 23 years of age is 2.5 times more likely to be killed in a crash than drivers 25 years and older, according to the NHTSA.[27] Whereas the young driver crash risk on a per-mile driven basis is greater than the crash risk of other drivers, their risk decreases on the continuum from 16 to 24 years old, according to Lerner et al.[28]

Incidents involving younger drivers are attributed to age and experience-related factors. Widely recognized age-related factors reported by Decina et al.[29] include risk-taking and alcohol consumption. Experience-related factors include the psychomotor, perceptual, and cognitive skills required for steering and maintaining speed, driving during high risk periods (such as at night), inefficient or inappropriate scanning behavior, poor hazard recognition, and poor driving judgment and decision-making.

The young driver demonstrates poorer coordination of separate driving tasks and tends to concentrate on one aspect of performance, such as maintaining lane position.[29] According to Mournat et al.,[30] the visual scanning behavior of a young driver is less effective than that of mature drivers because the young driver tends to focus more closely in front of the vehicle. Furthermore, Miltenburg and Kuiken[31] report that the inexperienced driver is likely to have attention drawn to irrelevant but "attention-getting" objects. The aforementioned research suggests that the young driver may be more vulnerable to distractions than the more mature

driver. The data indicate that the young driver has weak situational awareness and relatively poor focus on the driving task itself. Thus, distracting stimuli, inside or external to the vehicle, may adversely affect the young driver.

2.5.2 Driver Familiarity with Route

Commuters and visitors require different information while traveling. The familiar driver requires more information on traffic conditions and incidents, whereas the visitor requires more navigational and guidance information. A field study of driver visual search and scan patterns performed by Mourant et al.[30] showed that drivers' visual fixations on traffic, road and lane markers, and bridges and road signs decreased as the drivers became more familiar with the routes. One conclusion from these data is that drivers who are familiar with a roadway may be less likely to attend to familiar signs, including EBBs. Thus, differences between visitors and commuters in visual attention to commercial signs may be a relevant variable in assessment of distraction effects of EBBs since more eye-catching displays may be needed to attract the commuter.

2.6 Measures of Effectiveness

2.6.1 Surrogates

Commercial EBBs are designed to "catch the eye" of drivers. Their presence may distract drivers from concentrating on the driving task and the visual surrounds. Research in other areas share a concern about driver distraction and may be applicable to the question of EBBs and driving performance. Investigations of driver distraction and safety have notably focused on two cases: cellular telephone use while driving, and in-vehicle information displays. In each case, the application of a new technology raised concerns about driver distraction. The following sections highlight research in these areas.

Cellular Telephone Use in Vehicles. The number of cellular telephone users reported by Cain and Burris[32] in 1998 was 63 million, and at a growth rate of 40 percent per year, the NHTSA[33] estimates that the number of users will reach 80 million by 2000. The increase in the number of cellular telephone customers, in combination with high-profile crashes involving cellular telephone use, has raised public awareness of the safety aspects of in-vehicle telephone use and led to legislative initiatives aimed at restraining telephone use in vehicles.

Crash Risk Analyses. Redelmeier and Ticshirani[34] performed an epidemiological study of crash risk associated with cellular telephone use linked customer telephone bills to crash records maintained at the New York Collision Reporting Center to identify telephone use at the time of a crash. The study concluded that cellular telephone use quadrupled the risk of a crash during the call. Another epidemiological study performed by Violanti[35] found a 34 percent increase in risk of crash among vehicles with celluar telephones.

Application to EBBs. Using cellular telephones while driving imposes at least three tasks: first, manually manipulating the telephone, which could affect control of the vehicle; second, glancing at the telephone, which requires looking away from the roadway; and third, engaging in conversation, which may disrupt concentration. The relevance of information on cellular telephone use to EBBs lies in visual (glancing) and cognitive (mental engagement) behaviors. Viewing EBBs or using a telephone requires drivers to look away from the roadway for some

period. Similarly, reading a sign could disrupt a driver's concentration, just as engaging in a telephone conversation might.

According to Cain and Burris,[32] hands-free telephone use carries about the same risk observed in hand-held use, and a NHTSA report[33] cites that a telephone conversation is a factor in crashes more frequently than dialing. Cain and Burris[33] believe that the type of conversation is significant in determining crash risk, and McKnight and McKnight[36] believe that complex and intense conversations the riskiest and simple conversation relatively risk-free. Thus, becoming mentally preoccupied can be as distracting to a driver as manually operating a telephone or glancing away from the roadway.

In-vehicle Information Systems. Advances in communications technology have enabled the development of electronic devices that display traveler-related information to drivers in transit. Such devices can potentially redirect (or distract) a driver's attention from the primary task of driving. An examination of in-vehicle distractions may contribute to an understanding for potential out-of-vehicle distractions such as EBBs.

The presence of in-vehicle devices that provide traveler-related information, such as turn-by-turn directions, has raised questions regarding the amount of time taken away from the driving task by the information display. One concern is that a driver will underestimate the amount of time required to use the device, take longer than expected, thus taking too much time away from the driving task. This is similar to the concern in which a driver spends too much time looking at a stimulus external to the vehicle.

In order to measure visual distraction associated with the use of in-vehicle devices, a methodological approach was developed based on eye glances. This method calculates the total number and average duration of eye glances required to operate specific in-vehicle devices. Data compiled from research in the late 1980's defined the average time for a single glance and the average number of total glances required to use a variety of devices. Devices were the speedometer, mirrors, standard radio, climate controls, smoking/lighting, fuel gage, heating/air conditioner, map, and others. For example, using the radio required 1.20 sec of glance time and 3.5 total glances, and reading the map required 1.70 sec of glance time, and 5.0 total glances. Wierwille and Tijerina[37] performed one investigation into this issue that compared exposure levels for in-vehicle devices to number of crashes associated with the use of these devices. Exposure was the number of glances, multiplied by the time for a single glance, multiplied by the frequency of use. When the variety of in-vehicle devices was examined in light of both number of crashes and their exposure, a linear relationship resulted such that the greater the exposure, the greater the number of crashes. This study suggested that the "...relative number of accidents is directly related to visual resource allocation for in-vehicle tasks." The data regarding amount of time used for in-vehicle devices reported in this study may be a useful starting point for estimating the maximum amount of time that a driver can attend to a distraction outside the vehicle.

2.6.2 Current Measurement of Distraction

It would be beneficial to measure the effect that EBBs have on driver distraction. Such measures for EBBs and other stimuli external to the vehicle have not yet been developed. However, there is one approach being developed for in-vehicle information systems that, with some refinement, may serve as a measure of EBB distraction.

Olsson and Burns[38] describe a peripheral detection task (PDT) that is designed to measure visual distraction and driver mental workload. This study included measures of reaction time and correct detection rate for drivers who were asked to report the presence of an LED dot shown briefly at slightly different locations on a windshield while: 1) driving on country roads and a motorway and 2) performing a secondary task while driving. The dots were projected 11-23 degrees to the left of the straight-ahead view and 2-4 degrees above the horizon. This location approximates the visual angle that corresponds to a pedestrian or some roadside signs.

Statistically significant results indicated that a CD manipulation task and a backwards counting task required a longer performance time and resulted in fewer correct detections than the baseline driving task. Since these drivers missed more targets when performing a secondary task and because it took longer to report the targets that were spotted, the PDT may be useful in assessing the distractibility of in-vehicle systems. The authors briefly discuss the necessity of defining a criterion such as a percentage correct detection rate and/or reaction time that would define driver distraction.

If the PDT can be applied to in-vehicle systems, it may also be applicable to stimuli external to the vehicle such as EBB and tri-vision signs. It would be necessary to adapt the methodology from an in-vehicle task to a vehicle-external stimulus and to define a criterion for distraction. The PDT procedure might also be employed in addition to the driver performance measures described above, i.e., measures of lateral deviation and speed selection.

3 SYNTHESIS

The objective of the literature review was to identify and summarize the potential safety effects of EBBs on driving behavior. The present discussion examines the results of that review.

One of the initial sections of the review sought research reports that directly approached the safety effects of EBBs on the driver by examining crash rates related to the EBB; unfortunately, this subject is not well documented. In most instances, researchers were not able to verify that an EBB was a major factor in causing a crash. Only one study since the 1980 review and one lawsuit were identified.

After presenting research that directly addressed the relationship of EBBs to crashes, the literature review examined research regarding distraction, conspicuity, and legibility. Studies were identified that verified that: an increase in distraction, a decrease in conspicuity, or a decrease in legibility may cause an increase in the crash rate. While all of the identified research was transportation related research, only the legibility research examined electronic signs (e.g., CMSs).

There is indication that individual differences in age and driving experience may be important considerations in driver distraction, and are relevant to understanding driver responses to the external environment. Furthermore, research regarding driver familiarity of their route demonstrated that visual fixations on roadway signs decreases as route familiarity increases. This research may show that there is a difference between commuter and visiting drivers.

While the surrogates that were identified in Section 2.6.1 are not related to EBBs, it is believed that the planning that is performed in these fields is useful to this review. Research concerning in-vehicle distractions caused by cellular telephones and navigation display was reviewed in an attempt to associate conditions in which driver distraction can be identified and to determine how a driver may react. Further review of these fields is warranted at a later date.

At this point, it appears that there is no effective technique or method appropriate for evaluating the safety effects of EBBs on driver attention or distraction. Crash studies can show that EBBs may increase the crash rate, but research regarding driver familiarity can argue that commuter drivers may not even look at an EBB. This example is nicely illustrated by the Milwaukee County Stadium's variable message advertising sign. A before and after crash analysis showed an increase in the crash rate after the installation of the sign, but not to the point to warrant its removal and the sign remained in-place for 16 years.

The literature review identified research that addressed particular characteristics of an EBB. For example, distraction, conspicuity and legibility research performed on CMSs is relevant to the contrast and luminance of an EBB. The following section of this document takes EBB research to the next level. It presents a research plan that will allow for a more complete understanding of the potential safety effects of EBBs on driver attention and distraction by pulling together the information that has been gathered from unrelated studies and recommend a research plan to help answer the knowledge gaps.

4 RESEARCH NEEDS

The synthesis of the review indicated several areas in which more information would contribute to a better understanding of the safety implication of EBBs and tri-vision signs. These areas are expanded into research recommendations in this section. Each of these recommendations or research questions presented in this section reflect a concern for driving safety.

To obtain information regarding the influence of EBBs or tri-vision signs on driving performance, it is necessary to examine these displays in a variety of situations. For instance, it is possible that driving performance would be affected on curves but not on tangent road segments. The depiction of motion on a screen may be disruptive to driving whereas a static screen may not. The primary objective of the research to be proposed is to determine whether there are conditions under which EBB or tri-vision signs constitute a driving concern as indicated by crashes or other form of degraded driver performance. If such conditions are identified, then additional research may be required to gain a detailed understanding of the issue. These research goals will be identified as *Research Questions*.

Information that was available in an area that may support EBB safety was identified as *Research Findings*. This information primarily focuses on text issues, particularly with the legibility of letters and words; information regarding symbols or graphics was not identified. Since the identified research was not performed in an EBB context, it may be worthwhile to replicate selected research findings in conditions based on EBB requirements. Thus, some of the findings will be followed by research questions.

The issues described below have been researched to varying degrees. Some questions, such as the effect of a motion-based display on driving safety, have not been fully researched yet. Other issues, such as minimum exposure time for a display, have been addressed by states with little or no research basis. Questions on legibility have been addressed, but in a context for providing traffic information to drivers. The research questions fall into three general areas of highway safety: the roadway, EBBs and tri-vision signs, and the driver. The section on EBBs and tri-vision signs is presented in two parts: the first addresses relatively global aspects of the billboard such as motion phenomena and exposure time. The second part addresses the more detailed issues of individual letters and words.

4.1 Roadway Characteristics

Different roadway characteristics exert varying demands upon driver attention and skill. Particular roadway configurations and their characteristics may be more or less suitable for EBBs, and are important to consider when evaluating the safety effects of EBBs. The roadway characteristics listed below have special considerations relative to the issue of distraction and safety.

- **Horizontal and Vertical Curves.** Compared to tangents, curved roadway segments require more adept handling from drivers. Thus, any distraction presented by an EBB may be larger in conditions when the driver is experiencing greater demands.

  Research Questions - Curves: Is driver performance affected adversely by the presence of EBB or tri-vision signs on vertical curves, horizontal curves or even at a tangent segment? What is the role of vehicle speed and posted speed in this question? What effect does the radius of the curve, or other features of the horizontal curve, have in this

situation? Does vehicle speed change on a tangent segment in the presence of an EBB or tri-vision sign?

- **Interchanges and Intersections**. Demands made upon the driver increase at interchanges and intersections. For example, at highway interchanges, drivers execute multiple tasks, including controlling lateral position in their lane, maintaining appropriate headway and speed, and navigating through traffic as they merge or turn. At intersections, drivers are required to attend to multiple sources of potential conflicts, such as pedestrian crossings, changing traffic control devices, and turning maneuvers. Potentially distracting stimuli, including EBBs, may be particularly disruptive to drivers under the increased demands associated with interchanges and intersections. Current federal and state statutes prohibit the placement of roadside signs and displays near interchanges and intersections. EBBs offer a potential for driver distraction similar to or greater than conventional billboards, and should be considered to be subject to the same restrictions on placement near interchanges or intersections. Current state statues and regulations employ different values ranging from 152 to 305 m (500 to 1000 ft). The effects of EBBs and tri-vision signs on driver performance should be examined to determine if performance deficits are observed.

  Research Questions - Intersections: Will an EBB or a tri-vision sign located near an intersection contribute to degraded driver performance? If driving performance is found to be degraded, then what should be the distance between this type of display and the intersection?

  Research Questions - Interchanges: Will an EBB or a tri-vision sign located near an interchange contribute to degraded driver performance? If driving performance is found to be degraded, then what should be the distance between this type of display and the interchange?

- **Work Zones**. Drivers traveling in work zones need to be alert for changing traffic patterns, sudden stops, workers, pedestrians, and work equipment. Although drivers should reduce their speed in these zones, they often do not reduce speed sufficiently. This has resulted in special efforts by states to encourage safer driver behavior in such zones. Whatever the reason for current selection of improper speed in a work zone, it is possible that the presence of an EBB or tri-vision sign would aggravate the problem. Research about the effects of EBBs in work zones on safety should be performed, since the presence of additional visual distractions may elevate the risk of driver distraction and unsafe driving.

  Research Questions – Work Zone: Will an EBB or a tri-vision sign that is located near a work zone promote unsafe driving? What constitutes close proximity to a work zone and how should the work zone dimensions be defined relative to the EBB?

- **Distance between EBBs/Tri-vision Signs.** Drivers may not direct sufficient attention to the driving task if EBB or tri-vision signs are too close to each other. Federal and state regulations address conventional billboards on this factor. Due to the greater conspicuity of EBBs relative to conventional billboards, it may be useful to reexamine the minimum distance between EBBs and tri-vision signs.

Research Question – Distance Between EBB/Tri-vision Signs: Define an appropriate distance between EBBs and/or tri-vision signs that ensures driving safety.

4.2 EBB and Tri-vision Sign Characteristics

Research on EBBs should be directed toward the characteristics of EBBs, including placement, visual movement, and luminance. Research should include the characteristics of EBBs listed below.

- **Message Content and Comprehensibility.** If a driver attempts to read a display (either text or graphic) that is difficult to read due to factors such as excessive information, unfamiliar terms, and/or poor choice of word order, then the driver may not devote sufficient time to the driving task, thus raising a safety concern.

  Research Finding-Amount of Information: An analysis of the amount of information on static guide signs recommended that a sign panel should present no more than six bits of information. Examples of a "bit" of information provided by McNess and Messer[19] include "I-395, "Washington, D.C." and "South."

  Research Question-Amount of Information: This finding should be replicated in an EBB and/or tri-vision sign context. The terms and symbols used in the context of a roadway environment may present somewhat different results due, perhaps, to familiarity of terms. Another feature that is different is the use of pixels on EBB displays versus the painted signs in the roadway study.

  Research Questions – Quantity of Text: The Manual of Uniform Traffic Control Devices (MUTCD),[39] Section 2E-21 (applicable to CMSs for use on freeway and expressway mainlines), states that a CMS should display no more than three lines of text. Further, there should be a maximum of 20 characters per line. An analysis of these numbers for the simpler EBB displays, in conjunction with analyses of exposure times, may be useful. The acceptable amount of information in the pictorial and/or dynamic display, both EBB and tri-vision sign, could be determined at the same time. In these situations, other display components such as graphics, motion and/or exposure time should be examined in conjunction with quantity of information.

- **Exposure Times**. The time intervals associated with the display of an image and the transition between images may be important to safe driving and effective driver understanding of the display. The design of an EBB or tri-vision sign message will be more effective when the time constraints for the driving task and the required time for effective message transmission are considered together. A related factor is the length of the transition interval between messages or images. Transition time can be important during the rotation of elements on a tri-vision sign due to the visual effects of the rotation. Transition in an EBB can be almost instantaneous. The minimum exposure time for a display and maximum time for display transition have been provided by some states.

  Research Questions – Exposure Time: What factors determine the interval length for the safe display of a message? How can specific display times be determined? (For CMSs, the MUTCD 2000,[39] Section 2E-21 states that "The entire message cycle should be readable at least twice by drivers traveling at the posted speed, the off-peak 85th-percentile speed, or the operating speed.")

Research Questions – Transition Time: What is a safe transition time between messages? During the transition, should the display be completely dark? Should a transition interval between motion displays be a different time than a transition interval for static displays?

- **Motion and Other Image Components.** Some stimuli are particularly effective in attracting attention. It is not always clear which feature(s) of a complex stimulus is the most compelling. Motion is a highly likely candidate for an effective attention grabber. Motion can be provided in a billboard display in at least two ways. An EBB display provides motion when its lighted elements or pixels present an image in apparent movement across the display. An example is a high-resolution picture similar to a television image or video. Another example would be a text message sliding in from the side, top, or bottom. A tri-vision sign provides mechanical motion when its triangular elements rotate to present an alternate image. In this case, the motion is provided during a transition between displays. The motion component of an EBB or tri-vision sign may be more of a distraction than message content or pictorial arrangement. This possibility exists because a motion requires time and if a driver wants to see the entire movement for some inherent interest, then the driver will focus more on the motion display and less on the driving task. Note that the MUTCD 2000,[39] Section 2E-21 states that, "Techniques of message display such as fading, exploding, dissolving, or moving messages shall not be used" for a CMS.

  Research Questions – Motion Effects: To what extent will motion in an EBB or tri-vision sign contribute to degraded driver performance? What are the relevant dimensions of motion (e.g., presence vs. absence; low, medium or high speed; constant speed vs. variable speed; constant direction of moving item vs. change in direction)? How might motion interact with the content in a display to affect driver performance? Is the length of the interval during which motion occurs an important factor? Contexts to be considered for this research may include interchanges, intersections, curves, different vehicle speeds, and various TCDs including traffic signals.

  Research Questions – Other Image Components: How should the components of the image, or their combination, (e.g., motion, color, message content, amount of information) be examined to determine which are most likely to be particularly distracting? Or is the distractibility of these components conditional to the specific situations?

- **Maintenance**. Poor maintenance of an EBB or tri-vision sign can affect driving safety. If the letters and words become difficult to perceive due to scratched protective covers or because elements are not functioning due to wear, drivers interested in the expected message may devote too much attention to interpreting the characters. One phenomena requiring maintenance that may be unique to programmed light emitting elements is the condition in which some of the lighted pixels in a display fail to illuminate, thereby removing part of the word. In the same display, other pixels that should be off are lighted instead. In some cases, the display presents a sort of abstract design that may be engaging for its own sake. Depending on the particular instance, the message becomes difficult if not impossible to read, thus lengthening the time that a driver attends to the display.

Research Questions - Maintenance: Define the features of a sign that, if not maintained properly, contribute to driver safety issues. Develop criteria for achieving a minimal level of sign maintenance including a schedule and process for monitoring and repairing the sign.

4.3 Research Findings in Legibility

This section focuses on Research Findings that appear relevant to the use of text and graphical information on EBBs. These findings resulted from research on CMS displays that are used to transmit roadway information to drivers. The degree to which these findings are relevant may depend on the visual similarity between the EBB and the CMS. The CMS has a similar appearance to the simpler version of the EBB that was described in Section 2.1. Recall that the simpler version was characterized as employing a small character matrix for light emitted letters that are located on a dark background panel. It typically presents a limited number of words. The resemblance between CMS and EEB is likely to become less, however, with an opportunity for employing motion, a variety of colors, and higher resolution matrices. Such differences emphasize the need for research into EBB legibility. The present Research Findings are provided here as a starting point for that research.

Illegible letters, words and images promote longer reading times. This can result in a longer time for driver attention to be diverted away from the driving task. Because EBB letters are presented in a different medium than those in the more familiar road guide sign, they require special attention. The letters and numerals on a CMS or EBB are often formed from a group of lighted pixels or elements that are arranged in a rectangular matrix. The font or design of the letter is constrained by the number and arrangement of elements.

The resulting font is different than the familiar fonts seen on paper and painted surfaces in several respects. First, the latter family of fonts can take on a large variety of styles that take advantage of the flexibility of the brush or the dexterity of the type designer. Many of the simpler EBB displays, on the other hand, currently use a basic font matrix composed of few elements (e.g., 4x6, 5x7). This small number of elements severely limits the variety of font styles available and results in a relatively crude font style. Second, note that the discrete elements in the small matrix present a discontinuous letter "stroke" that is not present in the traditional medium, that is, the eye can perceive a separation between the light elements if the sign is not too distant. Third, the EBB matrix is represented by elements that emit light compared to the black print that is read under light. Fourth, the EBB matrix is viewed in both night and day conditions whereas the traditional printed page is viewed and read under only lighted conditions. Due to factors such as these, it is important to have research that directly addresses the legibility needs of the lighted pixel element display.

A recent summary of legibility data is available for CMSs on the roadway and was compiled by Garvey and Mace.[15] This information was compiled from a field survey of in-use CMSs, laboratory experiments and static field studies, and a partially controlled dynamic field study. From these results, the authors developed recommendations for CMSs. Information selected from these recommendations is presented in this section as research findings that may be useful for EBB design. Note, however, that this information was developed for CMSs and may not be directly transferable to an EBB due to differences in how they are used. EBB signs may have different requirements than the CMS and this may lead to different findings when researched.

Thus, information on CMS legibility should be considered only as approximate reference data for EBB design.

This section addresses only the legibility of letters and numerals that are composed of matrix elements for the simpler EBB. The legibility of pictures and other non-text graphics is not addressed. Legibility features that are addressed below include luminance, contrast, matrix size, letter size and proportion, and letter and letter group spacing.

- **Luminance.** In the determination of minimum luminance values for CMS signs, driver age and sun position relative to the CMS are important factors.

  Research Finding – Minimum Luminance: Recommended minimum luminance values (cd/m^2) for CMS visibility[1] provided by Garvey and Mace[(15)] are shown below:

Table 2. Recommended Minimum Luminance Values (cd/m2) for CMS Visibility.

	Sun Behind	Sun On Sign	Sun Overhead	Overcast/Rain	Nighttime
Young Driver (16-40)	1000	1000	850	350	30
Older Driver (65+)	1000[2]	1000[2]	1000	600	30

Source: Garvey and Mace.[(15)]

[1] 85th percentile driver accommodated at 198 m (650 ft).

[2] Will accommodate less than 50 percent of drivers at 198 m (650 ft) at any luminance level with extreme sun angles.

  Luminance levels for night were recommended to be between 30 and 150 cd/m^2.

  Research Question – Luminance In Inclement Weather: An important consideration for night viewing of an EBB is whether or not heavy moisture conditions such as fog, snow, or rain are present. These conditions may have a diffusing effect on luminance such that a sign with normal luminance may have altered contrast in fog conditions. It would be useful to define maximum luminance in fog conditions and various glare thresholds for young and older drivers.

- **Contrast and Contrast Orientation.** Clear discrimination of letters from their background is a basic requirement for seeing the letter and reading the text.

  Research Finding – Contrast Luminance: A ratio of an effective range of contrast luminance for CMS letters against their background is between 5 and 50 (15). Five represents a relatively low contrast between letter and background. Fifty indicates a high contrast.

  Research Finding – Contrast Orientation: Light text letters on a darker background are preferred. A black background or colored background is acceptable.[(15)]

- **Matrix Size.** The design of individual letters and numerals for the simpler EBB is based on a matrix of rows and columns in which each matrix element contains one "pixel." Each pixel can be selected to emit light or not emit light. The number of rows and

columns in a matrix is established to support the design of a character (letter or numeral). The size (number of rows and columns) of the character matrix is often the same for the design of all letters in the alphabet unless a continuous line matrix or full matrix is available. A given letter or numeral is defined by which pixels in the matrix are illuminated. In the 5 x 7 font discussed by Garvey and Mace,[15] an "I" is defined with 7 vertical pixels and an "M" is defined with a combination of 18 vertical and diagonal pixels. One issue for displays with larger pixels is to select a matrix with sufficient rows and columns to provide a legible character. If there are too few rows and/or columns, the design of the character font will result in a character that is difficult to recognize and read. If the size becomes overly large, space could be wasted for no noticeable increase in legibility. Maintenance may also increase due to an increasing number of lighted pixels.

Research Finding – Matrix Definition: A 5 x 7 matrix that used a single stroke font was found to be one of the most effective matrix sizes for characters used on a CMS.[15] The researchers recommended against using a double stroke font. One example of a double stroke font is defined by using two columns of pixels to form a vertical element in a letter such as "F" or "H." The researchers report that double fonts yield legibility distances about 25 percent shorter than regular fonts.

Research Question – Matrix Definition: As indicated by the researchers, various legibility factors are difficult to examine apart from each other. While the single stroke 5 x 7 matrix appears to be a generally robust minimum matrix size, it would be useful to replicate this finding for the simpler EBB context when analyzing other legibility factors.

- **Letter Size and Proportion.** The overall proportion of a letter and its components, as well as its height is an important determinant of the distance at which a letter can be recognized. The selection of these dimensions and proportions should consider a number of factors including posted speed and driver age.

  Research Finding - Letter Height: Letter heights have been researched. For instance, a letter height of 457 mm (18 in) was recommended for a CMS on roadways with an 89-km/h (55-mi/h) speed limit. This value is intended to accommodate drivers over 60 years of age.[15]

  Research Finding - Letter Width-to-Height Ratio: Width-to-height ratio should be at least 0.7 for a CMS. Legibility distance increases as much as 10 to 15 percent as the width-to-height ratio is increased from 0.7 to 1.0. Note, however, that this results in a corresponding increase in the width of a letter on the CMS[15]

  Research Finding - Stroke-Width-to-Height Ratio: A stroke-width-to-height ratio of no more than 0.13 is recommended for the CMS letter. Factors that enter this ratio are driver age, time of day, luminous intensity of the pixel element and amount of moisture in the air. For example at night, halation or irradiation can occur with light emitting elements at night that results in blurring of elements and letters. The distance at which a letter is legible will decrease by as much as 10 percent as stroke width ratio approaches 0.2.[15]

  Research Question – Letter Height: The distance at which characters should be legible for roadway information functions may differ from the commercial requirements of the

simpler EBB. The EBB requirements for letter height and proportion should be defined and examined with other relevant factors that determine letter height in an EBB context.

- **Spacing Between Letters and Letter Groups.** The degree of separation between letters influences their legibility. If they are too close, the letters appear to run together and require longer recognition time. This is particularly true at night for letters composed of light emitting elements. Because of the high contrast, luminous letters of the CMS tend to blur together more readily than the letters on standard signs. As a result, the separation between light emitted letters should be greater.

  Research Finding – Inter-Letter Spacing: For CMS signs that do not allow proportional spacing between letters, research indicates an inter-letter spacing of one-half the letter height.[15]

  Research Finding - Inter-Word Spacing: For CMS signs that have an inter-letter spacing of one-half the letter height or have proportional spacing, research indicates an inter-word spacing of the height of the letter. For inter-letter spacing 3/7 the letter height or less, inter-word spacing can be equal to 5/7 the letter height.[15]

  Research Finding – Inter-Line Spacing: An inter-line spacing of 70 percent of letter height is suggested for CMS signs with more than two lines of text. Twenty percent of letter height should be adequate for the separation between two lines of text. The 70 percent separation is important for providing legibility for the middle line when there are three lines of text.[15]

  Research Question – Spacing: Commercial signs may employ different features than used in the research referred to in this section. For instance, if a higher resolution matrix were used to present a commercial logo symbol or lower case letters, then the requirement(s) for letter separation may change. Such features may benefit from further research.

4.4 Driver Characteristics

Research on distraction effects of EBBs should include the variables of driving skill and vulnerability to distraction. A primary driver characteristic that can be studied in this regard is driver age, especially since driver-related cognitive and physiological variables including reaction time, visual acuity, and attention-sharing capacity correlate with age. Using young and older drivers as a "design" driver may yield lower and/or upper limits of parameters in EBB and tri-vision sign variables. For example, since older drivers have greater sensitivity to glare than do younger drivers, including older drivers in research on sign glare is important when determining limits to sign luminance.

- **Young Drivers**. The literature review conducted in Task 2 showed that young drivers are slower to detect traffic hazards, especially if the hazard is distant or emerging, and that young driver "situation awareness" of the roadway is less integrated and less sensitive to context. Of particular importance to the present report are indications that young drivers may have difficulty handling distracting events that compete for attention, whether the source is in-vehicle or external to the vehicle.

  Research Question – Young Drivers: Research should determine whether young drivers are more likely to demonstrate degraded driving performance in the presence of EBBs

and tri-vision signs and if so, to what extent. This factor could be present in most, if not all, of the studies described above.

- **Older Drivers**. Cognitive and visual deficits increase the difficulty of the driving task for older individuals. For example, the speed of visual processing and the capacity to allocate attention in divided attention tasks decline with age. Yet, each of these attributes underlies driving performance. Research on the older driver should focus on their driving performance in comparison to other age groups when they are exposed to EBBs and tri-vision signs in roadway configurations of higher driving task difficulty.

  Research Question – Older Drivers: Research should determine whether older drivers are more likely to demonstrate degraded driving performance in the presence of EBBs and tri-vision signs and if so, to what extent. This factor could be present in most, if not all, of the studies described above.

4.5 Other Potential Driver Distractions

In the literature review, research was presented on other types of stimuli that may distract a driver. These are the cellular telephone and the in-vehicle information display.

- Although research in cellular telephone and in-vehicle information displays does not currently appear to have direct application to EBBs or tri-vision signs, these analyses are ongoing and may still provide insights into the nature of driver distraction, the definition of distraction thresholds and approaches to minimizing distraction for safe driving.

  Research Question – Monitoring of Other Driver Distraction Research: Continue to follow the results of research on driver distraction, particularly in the area of cellular telephones and in-vehicle information displays to determine what may be learned, either in general principles or specific information, that is applicable to addressing potential distractibility from EBBs and/or tri-vision signs. Will the peripheral distraction task be a useful tool in assessing the distractibility of stimuli external to the vehicle? What modifications need to be made to make it applicable for both research and perhaps, even, evaluation of proposed billboards?

4.6 Future Research

A wide range of research questions for EBB and tri-vision signs has been addressed above. The general approach to these issues has been to establish under which conditions, if any, EBBs and tri-vision signs are most likely to affect driving safety. The area for which the most potentially applicable research is currently available is legibility. Other areas such as length of exposure time have received attention through state regulation. Some research areas such as whether motion in a display has any potential safety effect on driving seem to have received practically no attention. Since there are several potential research areas, approaches to efficiency in the analyses are useful. When planning future research on EBB and tri-vision sign safety questions, criteria may be developed that prioritize the questions. Such criteria might include a determination of which questions are the most urgent, the availability of existing field data for analysis, and the possibility of performing laboratory research. A second approach examines the possibility of combining research questions in one study. Thus, after prioritization, it could be useful to determine which issues should be investigated independently versus in an integrated manner.

4.7 Research Methods

This section briefly describes several research methods that may be applicable for the candidate research topics.

- **Documentation Analysis**. Two variations of this method are described. In the Before and After method, data (e.g., crashes) from a site without an EBB or tri-vision sign are compared to the data from the site after sign installation. If the latter number of crashes was substantially greater than the former, and there are no other significant changes to the site (i.e., change in volume, average speed, new construction, etc.) during the comparison times, then one can argue that the sign was associated with increased crashes. A variation of this approach compares the site of interest to a control site during the same period. This method compares data from an EBB or tri-vision sign site to data at a comparable, control site without a sign.
- **Field Study.** Field studies normally have observers collect data on driver and vehicle behavior at the site(s) instead of performing an analysis of documentation. If there were a substantial difference in quantity of behaviors, there would again be reason to argue that the EBB was associated with changed driver behavior. When this type of study is compared to the study of documentation, this study usually has more controlled conditions of observation as well as the advantage of examining more behaviors (e.g., swerving, braking) than just crashes. The analysis of documentation, however, is more likely to provide a greater number of crashes since the data collection period is likely to be longer.
- **Test Track.** Another method shares some of the advantages of a field as well as a laboratory study. A simulation of infrastructure elements such as pavement and signs is avoided. The dynamics of the vehicle is not a problem. In addition experimenter can control instructions to the driver, provide signs and objects of any design, repeat trials, and control presentation of stimuli. The use of a test vehicle in this situation could avoid crashes with other cars while allowing observation and documentation of lane keeping, speed, and other behaviors.
- **Simulation.** A laboratory study allows the researcher to examine specific conditions by simulating scenarios with a combination of hardware and software. The fidelity of the simulation can vary depending on the kind of research question being asked. The fidelity will also depend on the type of apparatus available to study the research question. Lane deviation, change in speed, and crashes can be measured in the laboratory. An advantage of the laboratory is the capability to provide a realistic context for the study that does not expose the participant to actual danger.

5 ANNOTATED BIBLIOGRAPHY

The following annotated bibliography summarizes three research papers on the possible distraction effects of systems that are located inside the vehicle. The references cited and summarized herein represent a sample of the extensive research literature on possible driver distraction from in-vehicle systems. This section briefly describes several studies that were evaluated in the present research effort, but were not included in the literature review itself.

1. Gellatly, A.W., and Kleiss, J.A. (2000). "Visual Attention Demand Evaluation of Conventional and Multifunction In-vehicle Information Systems." *In: Proceedings of the IEA 2000/HFES 2000 Congress.* Joint International Ergonomics Association 14th Triennial Congress and Human Factors and Ergonomics Society 44th Annual Meeting July 29, 2000-August 4, 2000.

This paper presents the results of a study of driver responses to executing conventional in-vehicle tasks and to operating a novel re-configurable, multifunction information system inside the vehicle. Six older and six younger drivers operated an instrumented test vehicle along a two-lane divided highway. Visual scanning behavior and driving task performance were measured while the research participants executed conventional tasks (e.g., climate control, audio control, and cellular telephone use) and advanced /future tasks (e.g., e-mail, navigation, audio, voice and video communications). The results showed that drivers completed all the tasks by means of a series of 1-1.5 sec glances to the in-vehicle display/control systems. Mean glance frequency increased linearly with mean task completion time, but mean glance duration remained constant over the range of mean task times observed. Mean task completion times were about twice as long for the re-configurable, multifunction information system as for the conventional in-vehicle devices. Certain driving task variables were correlated with mean task completion time. Both speed variability and lane variability (peak lateral acceleration) increased linearly as a function of mean task completion time. Although variability within the driving lane increased with task time, lane departure did not. Thus the research participants tended to stay in the lane, but exhibited more aggressive lateral position adjustments as the in-vehicle tasks became more complex and took longer. Overall, the data revealed a decrement in driving performance as the in-vehicle tasks took more time to complete. Therefore one design goal for any in-vehicle display/control device should be to minimize overall task completion time.

2. Rockwell, T.H. (1988). "Spare Visual Capacity in Driving – Revisited." In: A.G. Gale, M.H. Freeman, C.M. Hasleman, P Smith and S.P. Taylor (Eds.), *Vision in Vehicles II.* North Holland: Elsevier Science Publishers.

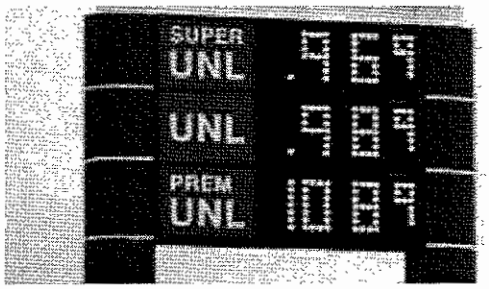
This paper summarizes a series of studies on in-vehicle visual sampling. The data were collected from 106 research participants in over 200 highway trips ranging in duration from 45 minutes to 1 hour. The studies measured off-road glances made by the drivers while completing a variety of in-vehicle tasks. Over 6,000 off-road glances were recorded. The in-vehicle tasks consisted of checking the speedometer, adjusting all three mirrors (left, right and rear-view), adjusting the stereo system (volume and tuning controls) and using a touch-screen CRT display. While the mean number of glances varied considerably from 1 glance to 40 glances, depending on the task, the average glance durations were extremely consistent, ranging from 1.27 to 1.42 sec for stereos and mirrors. Older drivers tended to require 20 percent more glances to execute a given command than younger drivers. Traffic density and highway geometrics had a substantial effect on average glance duration. While driving in dense traffic at high speeds on curves with short

headway distances, participants exhibited average glance durations that were 20 percent shorter for both stereo and mirror tasks. Thus glance durations are affected more by the requirements of the driving task than by the requirements of the in-vehicle task. As concerns the design of in-vehicle display/control devices, good design will be reflected more by a smaller number of glances than by shorter glances at the device.

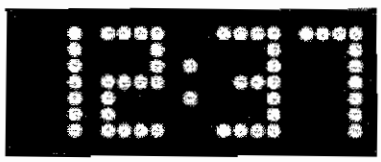
3. Wierwille, W.G. (1993). "Visual and Manual Demands of In-car Controls and Displays." In: Smith and Solame (Eds.), *Automotive Ergonomics*. New York: Taylor and Francis.

This chapter synthesizes a series of different studies by different researchers on the visual demands of in-vehicle tasks. Five types of tasks are defined, ranging from almost automatic manual only tasks, such as setting the directional signal lever, to complex visual-manual tasks, such as interacting with a navigational map display. A time-sharing model was developed to describe how drivers gather in-vehicle information. The model results in a driving strategy where short glances are made away from the driving task until the necessary in-vehicle information has been gathered. These in-vehicle glances tend to be between 1.0 and 1.6 sec. After each glance, the driver returns to the visual driving task. Compensatory visual sampling strategies have been demonstrated in studies where an apparatus periodically blocked the driver's forward view of the road for brief periods. In addition, forward view of the road increases with increasing traffic, a more difficult roadway or strong crosswinds. As concerns the older driving population, for a given in-vehicle task, single glance times and the number of glances into the vehicle both increase with age. The transition time between the forward view and the in-vehicle view also increases with age. Several remedies are suggested to minimize the visual load of in-vehicle tasks. These include the use of heads-up displays, virtual image displays and displays located near the top of the vehicle instrument panel. Other remedies include the use of auditory displays and training on improved visual sampling techniques. Designers of in-vehicle displays and controls are urged to minimize the demands of in-vehicle tasks. Some suggestions include avoiding clutter and improving labels and legends. Two areas are identified where future research is needed: 1) expansion and refinement of models of in-vehicle task performance and 2) better guidelines for in-vehicle task communications.

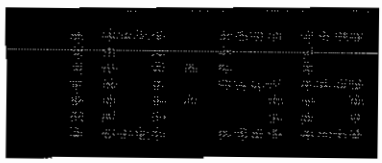
APPENDIX A: EXAMPLES OF ELECTRONIC BILLBOARDS



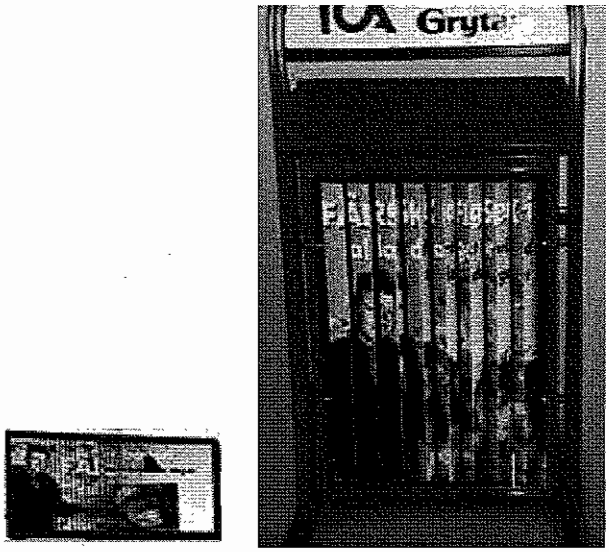
Incandescent Light Sign



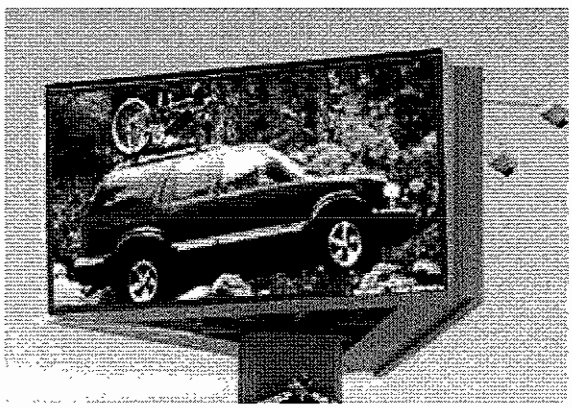
Incandescent Light Sign



LED Sign



Tri-vision Signs



Video Color LED

APPENDIX B: OUTDOOR ADVERTISING: STANDARD DEFINITION

Most states define the term "sign" using the following standard definition. States will vary specific wording, but this definition reflects the concept most states use.

"Sign" means any outdoor advertising sign, display, device, notice, figure, painting, drawing, message, placard, poster, billboard or other thing which is designed, intended or used to advertise or inform any part of the advertising or informative contents of which is visible from any place on the main-traveled way or any portion of an interstate highway or primary highway."

Definition exceptions:

Some states use the term "outdoor advertising device."

California adds "light or other thing."

Colorado adds "or other contrivance."

Florida – sign includes "any combination of structure and message."

Idaho adds "light device."

Massachusetts adds "whether fixed or movable."

As was noted in the literature review, few states define the term "electronic billboard." However, the definition above, with the catchall phrase "or other thing" appears broad enough to include electronic billboards in the standard definition of the term "sign."

Statutory Prohibitions:

The following list summarizes the statutory prohibitions identified during the review of state statutes and regulations. These prohibitions appear to apply to the standard "sign" as defined above, and are not directly targeted towards electronic billboards.

- Moving Parts/Animation: Eleven states prohibit moving or animated parts in signs, unless the signs are a public service announcement. A few states make an exception for movement related to the changing of a sign.
- Red/Flashing Lights: Thirty-six states prohibit signs that include a red, flashing, intermittent, or moving light, unless it is a public service display.
- Glare: Thirty-six states prohibit signs that are not sufficiently shielded to prevent beams or rays of light from causing a glare or vision impairment that affects driver vision.
- Interfering with Traffic Control Devices: Fifteen states include language prohibiting the placement of signs that obscure or interfere with TCDs. Twenty-nine states include language that prohibits signs that are illuminated in such a way as to obscure or interfere with TCDs.
- Timing Limit: Twelve states include some type of timing limit for the viewing of signs. Of these, only eight apply to EBBs or other types of signs with changing messages.
- Sign spacing: Twenty-nine states include spacing requirements for location of signs on interstate or primary highway systems. Twenty-one include similar limits on sign spacing along other state highways. Twenty-two include limits on the spacing of directional signs along interstate or primary highway systems.

- Language Usage: A number of states prohibit the use of wording that implies a traffic control or highway emergency (for example, use of the word "Stop"). Several states also prohibit the use of TCD signs or symbols (such as the eight-sided stop sign) in signs.

Potential Issues:

Based on this review of state statutes, the following are issues that embody the statutory and regulatory prohibitions adopted by states for conventional signs, and that may pertain to EBBs:

- Red, flashing, intermittent or moving lights,
- Glare,
- Use of TCD symbols and words,
- Illuminated or placement interfering with a TCD,
- Spacing, and
- Timing Limits.

Of the potential issues, timing limits may be the one issue where additional or expanded research would have the most significant benefit. The results of the state statutory review are shown in Appendix C.

APPENDIX C: RESULTS OF STATE STATUTORY REVIEW

	State Statutory References to Possible *"Guidelines"*							
Prohibitions on Signs...	**...with red, flashing, intermittent, or moving lights, unless it is a public service display**	**...that are not sufficiently shielded to prevent beams or rays of light from causing a glare or vision impairment that affects driver vision**	**...that are placed so as to obscure or interfere with traffic control devices**	**...that are so illuminated as to obscure or interfere with traffic control devices**	**...located on interstate or primary highway outside of zoning authority of incorporated cities within 500 ft of an interchange or intersection at grade or safety roadside rest area**	**...other state highway says – 300 ft limit**	**...directional signs may not be located within 200 ft of an interstate, or intersection at grade along the interstate system or other freeway, or within 2000 ft of a rest or scenic area or parkland**	**...timing limit**
Alabama	Yes	Yes	Yes	Yes	Yes		Yes	
Alaska								
Arizona	Yes	Yes		Yes			Yes	
Arkansas	Yes	Yes		Yes	Yes		Yes	
California	Yes	Yes		Yes	Yes	Yes	Yes	4 sec-message display, 1 sec-message change
Colorado NOTE: prohibits signs which have a moveable advertising face permitting any change in sign content or message	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Delaware	Yes	Yes		Yes	Yes	Yes	Yes	
Florida	Yes			Yes	1500 ft on interstate 1000 ft on federal aid primary highway			
Georgia NOTE: Prohibits signs with moving or animated parts unless certain conditions are met	Yes	Yes		Yes	Yes	Yes	Yes	Conditions: Message fixed for at least 10 sec. message changed in 3 sec or less. 5,000 ft spacing, default freezing sign if malfunction occurs

Hawaii								
Idaho NOTE: adds in blue lights	Yes	Yes		Yes	Yes between displays on interstate or primary highway or public/scenic areas 1000 ft from an interchange or rest area		Yes	Exposure time is long enough at maximum speed limit for sign message to be readable and comprehensible
Illinois	Yes	Yes	Yes	Yes	Yes		Yes	
Iowa NOTE: Prohibits animated or moving parts in a sign	Yes	Yes		Yes	Yes	Yes		Tri-vision signs – 4 sec minimum display, two sec for transition
Indiana NOTE: Prohibits animated or moving parts	Yes	Yes		Yes	Yes	Yes	Yes	
Kansas	Yes	Yes	Yes	Yes			Yes	
Kentucky Prohibits animation and movement except for movement on and off of the sign	Yes	Yes	Yes	Yes		Yes		Total message displayed within 10 sec, with each segment having a display time of 2 sec including change time
Louisiana NOTE: Statute obtained does not have information on restrictions								Signs must be readily viewed for a time of 5 sec from the roadway at posted speed limit
Maine								
Michigan	Yes	Yes		Yes	Yes	Yes	Yes	
Massachusetts NOTE: Prohibitions appear to be adopted by reference incorporating federal regulations								Not more than 3 rotating or alternate messages may be displayed on a sign

Minnesota	Yes	Yes		Yes	Yes			
Mississippi	Yes	Yes	Yes	Yes	Yes	Yes350 ft		
Missouri	Yes	Yes	Yes	Yes	Yes	Yes		
Montana	Yes	Yes		Yes			Yes	
New Hampshire **NOTE: Statute has no language on any prohibitions or restrictions.**								
Nebraska	Yes	Yes	Yes					
Nevada	Yes	Yes		Yes	Yes	Yes		Minimum display time of 6 sec, maximum change interval of 3 sec
New Mexico NOTE: Prohibits animation or moving parts	Yes	Yes	Yes	Yes	Yes		Yes	
New Jersey NOTE: Prohibits animation and moving parts	Yes	Yes	Yes	Yes	Yes		Yes	Minimum message time, 4 sec Maximum change time, 2 sec
New York NOTE: Prohibits animation or moving parts except for public service announcement.	Yes	Yes	Yes	Yes	Yes	Yes		
North Carolina	Yes	Yes		Yes	Yes	Yes		

North Dakota	Yes	Yes			Yes	Yes	Yes	
Ohio NOTE: No statutory information obtained								
Oklahoma	Yes	Yes		Yes				
Oregon	Yes	Yes	Yes				Yes	
Pennsylvania	Yes	Yes		Yes	Yes	Yes	Yes	
Rhode Island Note: Prohibits animation and moving parts		Yes	Yes		Yes, 750 ft	Yes 250 ft		
South Carolina	Yes	Yes			Yes	Yes	Yes	Viewing time 5 sec from roadside when traveling at speed limit
Tennessee	Yes	Yes		Yes	Yes 1000 ft	Yes 500 ft	Yes	
Texas NOTE: No statutory literature included in file								
Vermont								
Virginia	Yes	Yes		Yes	Yes		Yes	
Washington NOTE: Prohibits moving parts and animation	Yes	Yes	Yes					If sign change exceed 4 sec, turn sign off during change
Washington, DC								
West Virginia	Yes	Yes			Yes	Yes		Change time of 5 sec max without written approval
Wisconsin	Yes	Yes		Yes	Yes	Yes		
Wyoming	Yes	Yes	Yes		Yes	Yes	Yes	
Total of 42 states	36	36	15	29	28	21	22	

NOTE: Ten (10) states prohibit animation or moving parts except on public service announcements.

REFERENCES

1. Craford, M, Holonyak, N., and Kish, F., Jr. (2001). "In Pursuit of the Ultimate Lamp." *Scientific American*, 284, pp. 62-67.
2. Arkansas Highway Department (1967). *Regulations for Control of Outdoor Advertising Policy.* Little Rock, Arkansas Highway Department.
3. Wachtel, J. and Netherton, R. (1980). *Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage*. Report No. FHWA-RD-80-051. Washington, D.C: Federal Highway Administration.
4. Wisconsin Department of Transportation (1994). *Milwaukee County Stadium Variable Message Sign Study*. Wisconsin, USA: Internal Report, Wisconsin Department of Transportation.
5. Curriden, M. (2000). "Juries That Take Action Beyond the Law Have Deep Roots." *The Dallas Morning News.* Obtained from the World Wide Web: http://www.dallasnews.com/juries/101414_jurytwo_25buss.html
6. Treat, J.R., Tumbas, N.S., McDonald, S.T., Shinar, D., Hume, R.D., Mayer, R.E., Stanisfer, R.L., and Castellan, N.J. (1979). *Tri-Level Study of the Causes of Traffic Accidents.* Washington, DC: National Highway Traffic Safety Administration.
7. Wang, J., Knipling, R. and Goodman, M. (2000). "The Role of Driver Inattention in Crashes: New Statistics from the 1995 Crashworthiness Data System." Obtained from the August 2000 Driver Distraction Internet Forum sponsored by the National Highway Traffic Safety Administration on the World Wide Web.
8. Dornheim, M.A. (2000). "Crew Distractions Emerge as New Safety Focus." *Aviation Week and Space Technology*, 153(3), pp. 58-60.
9. Hughes, P.K. and Cole, B.L. (1986). "What Attracts Attention When Driving?" *Ergonomics,* 29(3), pp. 377-391.
10. Cole, G.L. and Hughes, P.K. (1984). "A Field Trial of Attention and Search Conspicuity." *Human Factors*, 26(3), pp. 299-313.
11. Theeuwes, J. (1996). "Visual Search at Intersections: An Eye-Movement Analysis." In: A.G. Gale, I. Brown, C. Haslegrave, and S. Taylor (Eds.), *Vision in Vehicles: VI.* New York: North Holland Press, Elsevier Science Publishers.
12. Akagi, Y., Seo, T, and Motoda, Y. (1996). "Influence of Visual Environments on Visibility of Traffic Signs." *Transportation Research Record*, No. 1553, pp 52-58. Washington, DC: National Academy Press.
13. Luoma, J. (1988). "Drivers' Eye Fixations and Perceptions." In: A.G. Gale, M. H. Freeman, C.M. Hasleman, P. Smith, and S.P.Taylor, (Eds
14. Rahimi, M., Briggs, R. and Thorn, D. (1990). "A Field Evaluation of Driver Eye and Head Movement Strategies toward Environmental Targets and Distractors." *Applied Ergonomics*, 21(4), pp. 267-274.
15. Garvey, P.M. and Mace, D.J. (1996). *Changeable Message Sign Visibility.* Report No. FHWA-RD-94-077. Washington, D.C: Federal Highway Administration.

16. Kuhn, B.T, Garvey, P. and Pietrucha, K.M. (1997). "Model Guidelines for Visibility of On-Premise Advertisement Signs." *Transportation Research Record,* No. 1605, Washington, D.C.: National Academy Press.

17. Kuhn, B.T. (1999). "The Impact of Illumination on Typical On-Premise Sign Visibility." *ITE Journal*, 4, p. 64.

18. Claus, R.J., and Claus, K.E. (1971). *Visual Environment: Sight, Sign and By-Law*. New York: The MacMillan Company.

19. McNees, R.W., and Messer, C.J. (1981). *Evaluating Urban Freeway Guide Signing*. Report No. FHWA/TX-81/5+220-3, Washington D.C: Federal Highway Administration.

20. Transportation Research Board (1990). *Safety Research for a Changing Highway Environment*. Publication No. ISBN 0-309-05056-1, SR 229. Washington, DC: Transportation Research Board, National Academy Press.

21. Barr, R.A., and Eberhard, J.W. (1991). "Special Issue Preface." *Human Factors,* 33(5), pp. 497-498.

22. Waller, P.F. (1991). "The Older Driver." *Human Factors,* 3(5), pp. 499-505.

23. Cerrelli, E. (1989). *Older Drivers, the Age Factor in Traffic Safety.* Publication No. DOT-HS-807-402, Washington, DC: National Highway Traffic Safety Administration.

24. Maleck, T.L. and Hummer, J.E. (1986). "Driver Age and Highway Safety." *Transportation Research Record*, No. 1059, Washington, DC: National Academy Press.

25. National Research Council (1988). *Transportation in an Aging Society (Vols.1 and 2).* Washington, DC: Transportation Safety Board, National Academy Press.

26. Ball, K., and Owsely, C. (1993). "The Useful Field of View Test: A New Technique for Evaluating Age-Related Declines in Visual Function." *Journal of American Optometric Association,* 64(1), pp. 71-79.

27. National Highway Traffic Safety Administration (1993). *Addressing the Safety Issues Related to Younger and Older Drivers: A Report to Congress*. Washington, DC: National Highway Traffic Safety Administration.

28. Lerner, N.D., Tornow, C. E., Freedman, M., Llaneras, R.E., Rabinovich, B.A., Steinberg, G.V. In press. *Preliminary Investigations of Highway Design Countermeasures to Aid Drivers with Limited Experience: Literature Review and Crash Data Analysis*. FHWA-RD-99-XXX Washington, DC: Federal Highway Administration.

29. Decina, L.E., Gish, K.W., Staplin, L. and Kirchner, A.H. (1996). *Feasibility of New Simulation Technology to Train Novice Drivers*. Publication No. DTNH22-95-C- 05104, Washington, DC: National Highway Traffic Safety Administration.

30. Mourant, R.R., Rockwell, T.H., and Rackoff, N.J. (1969). "Drivers' Eye Movements and Visual Workload." *Highway Research Record*, No. 292., Washington, DC: National Academy Press.

31. Miltenburg, P.G.M. and Kuiken, M.J. (1991). "The Effect of Driving Experience on Visual Search Strategies." In: M.J. Kuiken and J.A. Groeger, (Eds.), *Feedback Requirements and Performance Differences of Drivers*. Haren, the Netherlands: Traffic Research Centre, University of Groningen.

32. Cain, A., and Burris, M. (1999). *Investigations of the Use of Mobile Phones While Driving*. Florida, USA: Center for Urban Transportation Research, University of South Florida.

33. National Highway Traffic Safety Administration (1997). *Traffic Safety Facts 1996: Young Drivers*. Washington, DC: National Highway Traffic Safety Administration.

34. Redelmeier, D. A. and Ticshirani, R. J. (1997). "Association between Cellular-Telephone Calls and Motor Vehicle Collisions." *The New England Journal of Medicine*, 336(7), 453-458.

35. Violanti, J.M. (1996). "Cellular Phones and Fatal Traffic Collisions." *Accident Analysis and Prevention*, 30(4), pp. 519-524.

36. McKnight, J., and McKnight, A.S. (1991). *The Effect of Cellular Phone Use Upon Driver Attention*. Landover, MD: National Public Services Research Institute.

37. Wierwille, W.W. and Tijerina, L (1998). "Modeling the Relationship between Driver In-Vehicle Visual Demands and Accident Occurrence." In: A.G. Gale, I. Brown, C. Haslegrave and S.P.

38. Olsson, S. and Burns, P.C. (2000). "Measuring Driver Visual Distraction with a Peripheral Detection Task." Obtained from August 2000 The National Highway Traffic Safety Administration Driver Distraction Internet Forum on the World Wide Web.

39. Federal Highway Administration (2000). *Manual on Uniform Traffic Control Devices (MUTCD)*. Washington, DC: Federal Highway Administration.

ZONINGPRACTICE April 2008

AMERICAN PLANNING ASSOCIATION

ISSUE NUMBER FOUR

PRACTICE SMART SIGN CODES

Looking Ahead: Regulating Digital Signs and Billboards

By Marya Morris, AICP

Cities and counties have always been challenged to keep their sign ordinances updated to address the latest in sign types and technologies.

Each new sign type that has come into use—for example, backlit awnings and electronic message centers—has prompted cities to amend their regulations in response to or in anticipation of an application to install such a sign.

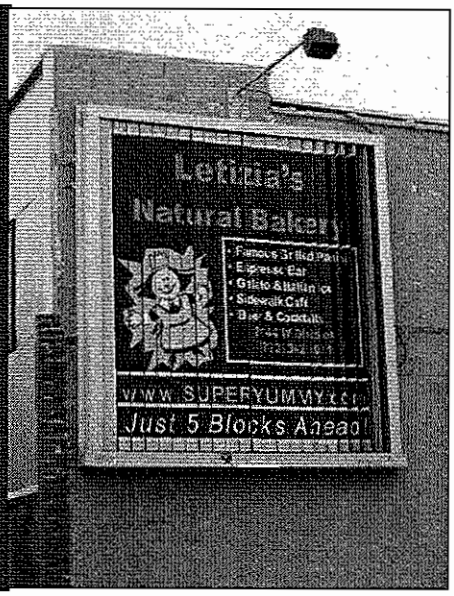
The advent in the last several years of signs using digital video displays represents the latest, and perhaps the most compelling, challenge to cities trying to keep pace with signage technology. More so than any other type of sign technology that has come into use in the last 40 to 50 years, digital video displays on both off-premise (i.e., billboards) and on-premise signs raise very significant traffic safety considerations.

This issue of *Zoning Practice* covers current trends in the use of digital technology on off-premise billboards and on-premise signs. It recaps the latest research on the effects of this type of changeable signage on traffic safety. It also discusses the use of digital video sign technology as a component of on-premise signs, including a list of ordinance provisions that municipalities should consider if they are going to permit this type of sign to be used. I use the phrase digital display or video display, but these devices are also referred to as LEDs or, collectively, as "dynamic signs."

BRIGHT BILLBOARDS

While digital technology is growing in use for on-premise signs, it is the proliferation of digital billboards that has triggered cities and counties to revise their sign ordinances to address this new type of display. Of the approximately half-million billboards currently lining U.S. roadways, only about 500 of them are digital. However, the industry's trade group, the Outdoor Advertising Association of America, expects that number to grow by several hundred each year in the coming years. In 2008, digital billboards represent for the sign industry what the Comstock Lode must have represented for silver miners in 1858—seemingly limitless riches. The technology allows companies to rent a single billboard—or pole—to multiple advertisers. A billboard company in San Antonio, for example, estimated that annual revenue from one billboard that had been converted from a static image to a changeable digital image would increase tenfold, from $300,000 to $3 million just one year after it went digital.

It is very difficult for cities and counties to get billboards removed once they are in place. Billboard companies have made a concerted effort to get state legislation passed that limits or precludes the ability of local



A typology of moving-image signs. The variable message sign at the right uses a motor to switch among three different static images. Next, the electronic messageboard at Wrigley Field in Chicago displays scrolling text and simple images. The on-premise digital sign, pictured third from left, looks like a giant television screen, displaying a steady stream of video images. On the far right, this digital billboard cycles through a number of static video images at regularly timed intervals.

ASK THE AUTHOR JOIN US ONLINE!

Go online from May 12 to 23 to participate in our "Ask the Author" forum, an interactive feature of Zoning Practice. *Marya Morris, AICP, will be available to answer questions about this article. Go to the APA website at www.planning.org and follow the links to the Ask the Author section. From there, just submit your questions about the article using the e-mail link. The author will reply, and* Zoning Practice *will post the answers cumulatively on the website for the benefit of all subscribers. This feature will be available for selected issues of* Zoning Practice *at announced times. After each online discussion is closed, the answers will be saved in an online archive available through the APA* Zoning Practice *web pages.*

About the Author

Marya Morris is a senior associate at Duncan Associates, a planning consulting firm specializing in land development regulations and infrastructure finance. www.duncanassociates.com

governments to require removal of existing billboards through amortization. The only option left is paying cash compensation. The federal Highway Beautification Act, which was modified many years ago under industry pressure, also prohibits amortization and requires cash compensation for billboard removal.

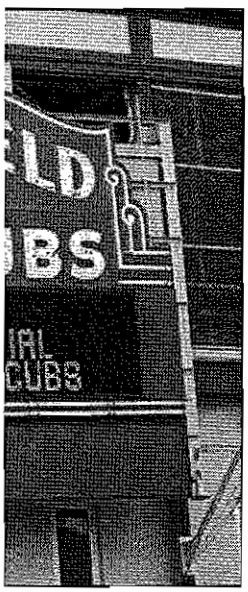
With the amortization option unavailable, some cities and counties have struck deals with billboard companies requiring them to remove two boards for every new one they install. Other jurisdictions have established simple no-net-increase policies. Although many communities have had success with these approaches, in the last few years the industry has devised a litigious tactic to secure new billboard permits. Billboard companies challenge the constitutionality of a sign provision, and when the ordinance is in legal limbo, they rush in to secure billboard permits.

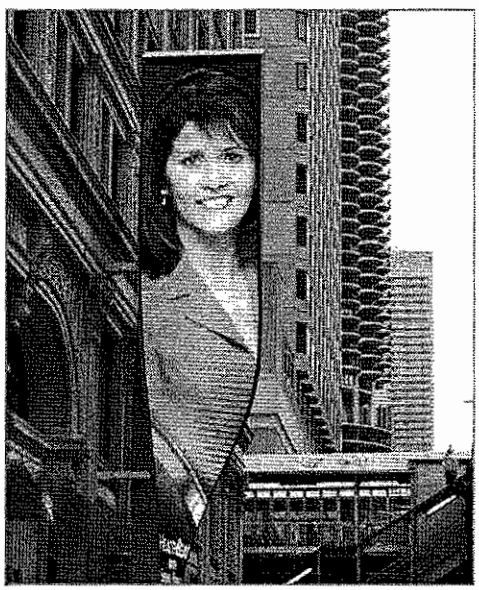
The American Planning Association has joined Scenic America, the International Municipal Lawyers Association, and others in filing amicus curiae briefs in many of these cases to show the courts the industry's pattern of conduct and deliberate strategy to circumvent local sign codes. A review in January 2006 found 113 such "shakedown" sign cases filed in the federal courts since 1997, and eight filed in state courts in the same time period. For more information visit the APA Amicus Curiae webpage at www.planning.org/amicusbriefs.

The emergence of the highly lucrative digital billboards has given local governments some leverage to at least reduce the total number of billboards.

The emergence of the highly lucrative digital billboards has also, however, given local governments some leverage to at least reduce the total number of billboards. Many of the applications cities are seeing for the video billboards are requests by companies to replace the static type with the new video displays in key locations. The added revenue potential from a digital format has proved to be enough of an incentive to get companies to agree to remove multiple static billboards in exchange for permits to install video display in certain locations.

In June 2007, Minnetonka, Minnesota, in the Twin Cities area, reached a settlement with Clear Channel in which the company agreed to

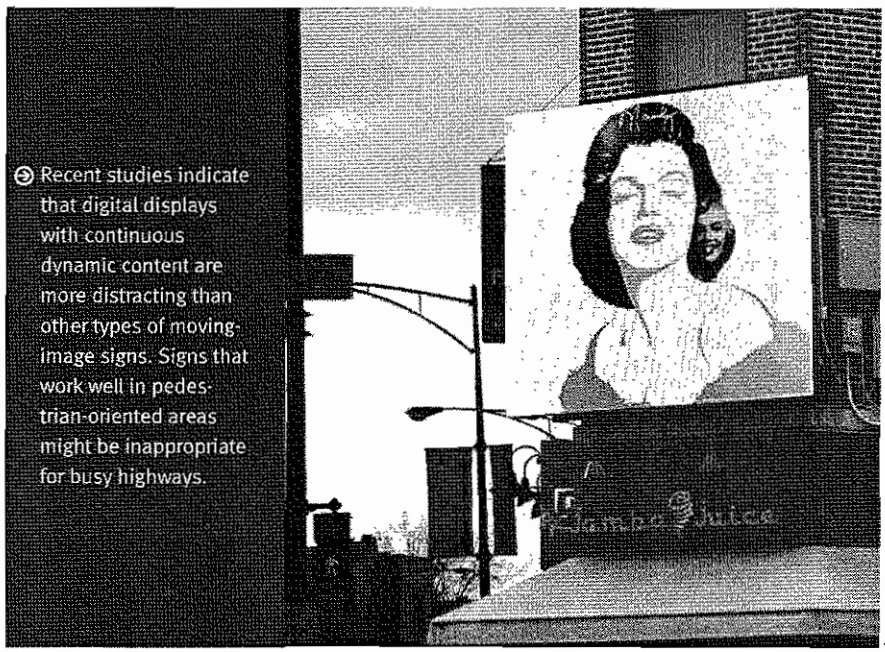




Photos by David Morley

remove 15 of the 30 conventional static image billboards in the city in exchange for permission to install its digital billboards. The city will permit the company to install no more than eight dynamic signs at four to six locations.

The City of San Antonio amended its sign and billboard ordinance in December 2007 to require the removal of up to four static billboards in exchange for permission to install one digital display billboard in their place. Prior to that amendment the city had no provisions for digital sign technology, but it did already have a two-for-one replacement requirement. The city has a developed a sliding scale that determines the number of billboards required to be removed in exchange for a single digital billboard. According to the scale, the number of digital signs permitted is determined by the total square footage of static billboard faces removed. Therefore, a billboard company will be required to demolish as few as three and as many as 19 billboards to get one new digital billboard structure placed or an existing static billboard face replaced.



Recent studies indicate that digital displays with continuous dynamic content are more distracting than other types of moving-image signs. Signs that work well in pedestrian-oriented areas might be inappropriate for busy highways.

David Morley

IT DEPENDS ON YOUR DEFINITION OF 'DISTRACTING'

Digital signs are brighter and more distracting than any other type of sign. Other attention-grabbers, like strobe lights, mirrors, searchlights, and signs with moving parts, are typically prohibited (or allowed under very narrow circumstances) by even the most hands-off jurisdictions. The high visual impact of digital signs has prompted highway and traffic safety experts to try to quantify how drivers respond to such distractions. This research, which is summarized below, has been instrumental in helping cities craft new sign ordinances that address the specific characteristics of such signs, including how often the messages or images change, the degree of brightness, and their placement relative to residential areas.

The Federal Highway Administration is currently conducting a study on driver distraction and the safety or impact of new sign technologies on driver attention. The initial phase, which is slated to be completed by June 2008, will identify and evaluate the most significant issues and develop research methods needed to secure definitive results. The FHWA anticipates the second phase of the research study and final report will be completed in the latter part of calendar year 2009. Also, the Transportation Research Board (a branch of the National Science Foundation) has formed a subcommittee to examine research needs on electronic signs.

Until a couple of years ago, one of the only studies on the effects of billboards and traffic safety was a 1980 survey of existing research on the subject prepared for the Federal Highway Administration (Wachtel and Netherton 1980). It did not, however, provide any concrete answers. The study noted "attempts to quantify the impact of roadside advertising on traffic safety have not yielded conclusive results." The authors found that courts typically rule on the side of disallowing billboards because of the "readily understood logic that a driver cannot be expected to give full attention to his driving tasks when he is reading a billboard."

A 2006 study by the National Highway Traffic Safety Administration that focused primarily on driver distractions inside the car (i.e., phone use, eating, and changing the radio station) concluded that any distraction of more than two seconds is a potential cause of crashes and near crashes.

A 2004 study at the University of Toronto found that drivers make twice as many glances at active (i.e., video signs) than they do at passive (i.e., static) signs. All three of the moving sign types that were studied (video, scrolling text, and trivision) attracted more than twice as many glances as static signs. They also found that the drivers' glances at the active signs were longer in duration; 88 percent of glances were at least 0.75 seconds long. A duration of 0.75 seconds or longer is important because that is the amount of time required for a driver to react to a vehicle that is slowing down ahead. Video and scrolling text signs received the longest average maximum glance duration.

An earlier study also at the University of Toronto that was designed to determine whether video billboards distract drivers' attention from traffic signals found that drivers made roughly the same number of glances at traffic signals and street signs with and without full-motion video

ORDINANCES AND ZONING REPORTS

- City of Minnetonka, Minnesota. 2007. Staff report to city council recommending adoption of an ordinance regulating digital signs. June 25. Available at www.eminnetonka.com/community_development/planning/show_project.cfm?link_id=Dynamic_Signs_Ordinance&cat_link_id=Planning.
- City of San Antonio City Code, Chapter 28. Amendment Adding Provisions for Digital Signs. Last revised December 2, 2007. Available at http://epay.sanantonio.gov/dsddocumentcentral/upload/SIGNsecDRAFTF.pdf.
- City of Seattle, Land Use Code, Section 23.55.005 Signs, Video Display Methods. Last revised 2004. http://clerk.ci.seattle.wa.us/~public/clrkhome.htm.

billboards present. This may be interpreted to mean that while electronic billboards may be distracting, they do not appear to distract drivers from noticing traffic signs. This study also found that video signs entering the driver's line of sight directly in front of the vehicle (e.g., when the sign is situated at a curve) are very distracting.

A 2005 study by the Texas Transportation Institute of driver comprehension of sign messages that flash or change concluded that such signs are more distracting, less comprehensible, and require more reading time than do static images. While this research did not evaluate advertising-related signs, it does demonstrate that flashing signs require more of the driver's time and attention to comprehend the message. In the case of electronic billboards, this suggests that billboards that flash may require more time and attention to read than static ones.

The City of Seattle commissioned a report in 2001 to examine the relationship between electronic signs with moving/flashing images and driver distraction. The study was conducted by Jerry Wachtel, who in 1980 had conducted the first-ever study on signs and traffic safety for the Federal Highway Administration.

The Seattle report concluded that electronic signs with moving images will distract drivers for longer durations (or intervals) than do electronic signs with no movement. The study also noted that the expanded content of a dynamic sign also contributes to extended distraction from driving. Specifically it found that signs that use two or more frames to tell a story are very distracting because drivers are involuntarily compelled to watch the story through to its conclusion.

Sign messages that flash or change are more distracting, less comprehensible, and require more reading time than do static images.

The Seattle study also found that drivers expend about 80 percent of their attention on driving-related tasks, leaving 20 percent of their attention for nonessential tasks, including reading signs. The report recommended the city use a "10-second rule" as the maximum display time for a video message.

APPROACHES TO REGULATING DIGITAL DISPLAY SIGNS

Most cities and counties that have amended their sign ordinances to address the use of digital display on on-premise signs and billboards have done so in response to an application by a sign owner to install a new sign that uses the technology or in response to a sign owner having replaced an existing sign face with a digital display. Some cities, like Minnetonka, were required by a court settlement with a billboard company to allow the technology. Although regulations for digital signs are still relatively new, we can group the regulatory approaches (or lack thereof) into three general categories:

1) Most sign ordinances are still silent on the issue of digital video displays, but almost all do regulate electronic message centers and also prohibit or restrict signs that move, flash, strobe, blink, or contain animation.

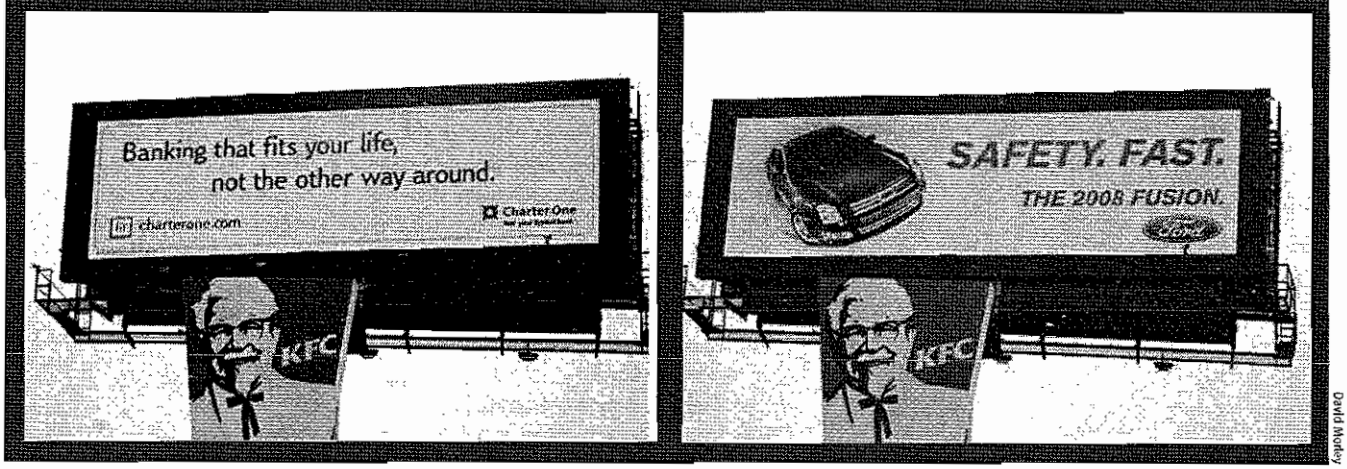
2) A smaller but growing number of sign ordinances contain a complete prohibition on digital video display signs while still permitting electronic message centers.

3) A relatively small number of sign ordinances have been amended to allow video display signs under narrowly prescribed circumstances and with numerous conditions.

For jurisdictions that want or need to allow them, the following section explains additional considerations that should be added to a sign ordinance to effectively regulate digital display signs.

Sign type. The ordinance must indicate whether the digital display can be used on off-premise billboards only, on on-premise signs only, or on both sign types.

Billboards with changeable digital images allow billboard companies to dramatically increase their revenue by renting the same sign face to multiple advertisers.



David Morley

Definitions. The definitions section must be updated to include a detailed definition of digital display signage and the sign's functional characteristics that could have an effect on traffic safety and community aesthetics.

Zoning districts. The ordinance should list the districts in which such signs are permitted and where they are prohibited. Such signs are commonly prohibited in neighborhood commercial districts, historic districts, special design districts, and scenic corridors, in close proximity to schools, and in residential districts. On the other end of the spectrum, East Dundee, Illinois, for example, expressly encourages digital video signs in two commercial overlay districts, but only a

RESOURCES

- Beijer, D. and A. Smiley. 2005. "Observed Driver Glance Behavior at Roadside Advertising Signs," *Transportation Research Record.*
- Dudek, C. L. et al. 2005. "Impacts of Using Dynamic Features to Display Messages on Changeable Message Signs," Washington, D.C.: Operations Office of Travel Management: Federal Highway Administration.
- *"Dynamic" Signage: Research Related To Driver Distraction and Ordinance Recommendations.* Prepared by SRF Consulting Group, Inc. for the City of Minnetonka, Minnesota. June 7, 2007 (www.digitalooh.org/digital/pdf/2007-minnetonka_digital-srf_consulting_report06-08-07.pdf).
- "The Impact of Driver Inattention on Near-Crash/Crash Risk: An Analysis Using the 100-Car Naturalistic Driving Study Data." 2006. National Highway Traffic Safety Administration, U.S. Department of Transportation. April.
- McBride, Sarah. "Seeing the Light: In Billboard War, Digital Signs Spark a Truce." *Wall Street Journal.* February 3, 2007.
- Smiley, A. et al. 2004. "Impact of Video Advertising on Driver Fixation Patterns." *Transportation Research Record.*
- *Unsafe at Any Speed: Billboards in the Digital Age.* 2007. Scenic America Issue Alert 2. Available at www.scenic.org/pdfs/eb.pdf. The Scenic America website has a number of excellent resources for planners and citizens interested in regulating digital signage, including a downloadable PowerPoint presentation, research summaries, and model ordinances.
- Wachtel, J. and R. Netherton. 1980. "Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage." Report No. FHWA-RD-80-051. Washington, D.C.: Federal Highway Administration.

few land uses—new car dealerships, multi-tenant retail centers, and amusement establishments—are permitted to have them.

Placement and orientation. A minimum spacing requirement between signs and residential areas should be considered, as should a provision requiring that the sign face be oriented away from residential areas and other scenic or sensitive areas. The Baker and Wolpert study recommended that dynamic signs be limited or prohibited at intersections, in demanding driving environments, and in places where they obstruct a driver's view. In Seattle, the sign face of on-premise digital signs must not be visible from a street, driveway, or surface parking area, nor may it be visible from a lot that is owned by a different person.

Sign area. For on-premise signage, many ordinances include a limit on the percentage of the sign face that can be used for digital display. Thirty percent is common although in some areas, such as entertainment districts, that proportion may be much higher.

Illumination and brightness. The ordinance should address the legibility and brightness of a sign both during the day and after dark. During the day the issue is reducing or minimizing glare and maintaining contrast between the sign face and the surrounding area. At night the issues are the degree of brightness and its impact on driver distraction and on light trespass into residential areas. In the study for the City of Minnetonka, researchers noted the challenge posed by this aspect of digital signs: "There is no objective definition of excessive brightness because the appropriate level of brightness depends on the environment within which the sign operates."

Message duration and transition. The ordinance must include a minimum duration of time that a single message must be displayed. Typically this is expressed in terms of seconds. The San Antonio billboard ordinance requires each image to remain static for at least eight seconds and that a change of image be accomplished within one second or less.

The city's ordinance requires any portion of the message that uses a video display method to have a minimum duration of two seconds and a maximum duration of five seconds. Further, it requires a 20-second "pause" in which a still image or blank screen is showed following every message that is shown on a video display.

Public service announcements. In exchange for permission to use digital displays, owners of billboards in Minnesota and San Antonio have agreed to display emergency information such as Amber Alerts and emergency evacuation information. Such a requirement can be included in an ordinance or imposed as a condition of approval.

Whether undertaking a comprehensive revision of a sign ordinance or more limited, strategic amendments to address digital technology, there are other common provisions related to electronic and digital signage that should be revisited as part of the rewrite. At the top of the list would be updating standards for conventional electronic message centers to reflect the latest research regarding driver distraction and message duration. Also, the boilerplate provisions common to so many ordinances that prohibit signs that flash, are animated, or simulate motion should also be rethought. These provisions could conceivably be used to prohibit digital displays without additional regulations. The problem is that these characteristics are very rarely defined in the ordinance and remain open to interpretation. Also, whenever new regulations are being considered for digital billboards, jurisdictions should take the opportunity to draft new provisions to address digital technology for on-premise signs as well. And, finally, any time the sign ordinance goes into the shop for repair—whether to address digital signage or to make broader changes—is a good time to remove or revise any provisions that violate content neutrality rules.

NEWS BRIEFS

SMART GROWTH TAKES A HIT IN MARYLAND

By Lora Lucero, AICP

The *Baltimore Sun* hit the nail on the head when it reported on March 12 "[t]he state's highest court declared that Maryland law does not require local governments to stick to their master plans or growth-management policies in making development decisions."

Trail, et al. v. Terrapin Run, LLC, et al. presented an important question for the court to address: What link is required between the community's adopted plan and the decision by the Zoning Board of Appeals (ZBA) to grant or deny a request for a special exception? In a 4 to 3 vote, the majority concluded that Article 66B, the state planning law, is permissive in nature and plans are only advisory guides, so a strong link between plans and implementation is not required. The court affirmed the county's

The majority concluded that the state planning law is permissive in nature and plans are only advisory guides, so a strong link between plans and implementation is not required.

approval of the special exception and determined that the "in harmony with" traditional standard in applications for special exceptions remains the standard, in the absence of specific legislative language to the contrary. The court's decision is available at www.planning.org/amicusbriefs/pdf/terrapinrundecision.pdf.

Terrapin Run, LLC, the developer, proposed to build an "active adult" community of 4,300 homes on 935 partially wooded acres in Allegany County, a rural area of mountainous Western Maryland. The land is primarily zoned District "A" (Agricultural, Forestry, and Mining), with a portion located in District "C" (Conservation). In addition to the homes, the developer proposed to build an equestrian center, a community building, and a 125,000-square-foot shopping center.

The residential density is 4.6 units per acre. A planner who testified at trial indicated that the density of the proposed development would approximate that of Kentlands, in Montgomery County. The initial phase of development would use individual septic tanks, but the project would eventually require its own sewage treatment plant. Significantly, the property is not located in one of Maryland's priority funding areas.

The zoning ordinance divides Allegany County into urban and nonurban areas. "A" and "C" are classified as nonurban zoning districts. The zoning ordinance provides:

> "Non-urban districts are designed to accommodate a number of non-urban land uses including agriculture, forestry, mining, extractive industries, wildlife habitat, outdoor recreation, and communication, transmission and transportation services, as well as to protect floodplain areas, steep slope areas, designated wetlands and habitat areas, and Public Supply Watersheds *from intense urban development.*" Allegany County Code, Chapter 141, Part 4 (Zoning) §141-5(B) (emphasis supplied).

Opponents to the project argued that the ZBA erred when it found that strict conformity with the plan was not required and that the proposed development would be "in harmony with" the Allegany County Comprehensive Plan because Maryland Code (Article 66, § 1(k)) requires a special exception to be "in conformity with" the plan.

Gov. Martin O'Malley's administration argued in its amicus brief that counties and municipalities are required to conform to the seven broad "visions" for growth in Maryland as listed below:

> **§ 1.01. Visions**
>
> (1) Development is concentrated in suitable areas.
>
> (2) Sensitive areas are protected.
>
> (3) In rural areas, growth is directed to existing population centers and resource areas are protected.
>
> (4) Stewardship of the Chesapeake Bay and the land is a universal ethic.
>
> (5) Conservation of resources, including a reduction in resource consumption, is practiced.
>
> (6) To assure the achievement of items (1) through (5) of this section, economic growth is encouraged and regulatory mechanisms are streamlined.
>
> (7) Adequate public facilities and infrastructure under the control of the county or municipal corporation are available or planned in areas where growth is to occur.

APA and its Maryland Chapter jointly filed an amicus brief. We argued that "[p]lans are documents that describe public policies that the community intends to implement and not simply a rhetorical expression of the community's desires." APA's position is that (1) the adopted comprehensive plan must be implemented; (2) effective implementation requires that the day-to-day decisions made by local officials be consistent with the adopted comprehensive plan; and (3) the court's review of whether consistency is achieved should be more searching when local officials are acting in their administrative (quasi-judicial) capacity. APA's amicus brief is available at www.planning.org/amicusbriefs/pdf/terrapinrun.pdf.

The lengthy majority opinion (52 pages) recounts much of Maryland's legislative history in statutory reforms. "[T]his case, in one sense is a continuation of legislative battles that began in the early 1990s, where representatives of the environmental protection and professional land planning interests attempted to establish that the State, or State planners, should exercise greater control than theretofore enjoyed over most aspects of land use decision-making that then reposed in the local jurisdictions" (*Trail, et al. v. Terrapin Run, LLC, et al.*, 2008 WL 638691, p.1). The majority concludes that the "in harmony" standard is synonymous with "in conformity." However, the three dissenting justices said the majority "sets special exception considerations on a lubricious path" (*Trail, et al. v. Terrapin Run, LLC, et al.*, Minority Opinion, p.13). The statutory amendments made by the legislature in 1970, and subsequent case law, buttresses the argument that a stricter linkage is required between the adopted plan and the grant of a special exception, the minority opined.

Richard Hall, Maryland secretary of planning and past president of the Maryland Chapter of APA, said: "We think this is a time when we need more smart, sustainable growth, not less." The O'Malley administration is going to study the ruling before deciding whether to advance legislation to reverse the court's decision.

Lora Lucero, AICP, is editor of Planning & Environmental Law *and staff liaison to APA's amicus curiae committee.*

Cover concept by Lisa Barton.
Photos: Sign © iStockphoto.com/David McShane; Screen © iStockphoto.com/Alexey Khlobystov

VOL. 25, NO. 4

***Zoning Practice* is a monthly publication of the American Planning Association. Subscriptions are available for $75 (U.S.) and $100 (foreign). W. Paul Farmer, FAICP, Executive Director; William R. Klein, AICP, Director of Research.**

Zoning Practice (ISSN 1548–0135) is produced at APA. Jim Schwab, AICP, and David Morley, Editors; Julie Von Bergen, Assistant Editor; Lisa Barton, Design and Production.

Copyright ©2008 by American Planning Association, 122 S. Michigan Ave., Suite 1600, Chicago, IL 60603. The American Planning Association also has offices at 1776 Massachusetts Ave., N.W., Washington, D.C. 20036; www.planning.org.

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the American Planning Association.

Printed on recycled paper, including 50-70% recycled fiber and 10% postconsumer waste.

ZONINGPRACTICE
AMERICAN PLANNING ASSOCIATION

122 S. Michigan Ave.
Suite 1600
Chicago, Il 60603

1776 Massachusetts Ave., N.W.
Washington D.C. 20036

IS YOUR COMMUNITY READY FOR DIGITAL SIGNAGE?

4

Memorandum

U.S. Department of Transportation
Federal Highway Administration

Subject: **INFORMATION:** Guidance on Off-Premise Changeable Message Signs

Date: September 25, 2007

In Reply Refer To: HEPR -20

From: Original signed by:
Gloria M. Shepherd
Associate Administrator for
Planning, Environment, and Realty

To: Division Administrators
Attn: Division Realty Professionals

Purpose

The purpose of this memorandum is to provide guidance to Division offices concerning off-premises changeable message signs adjacent to routes subject to requirements for effective control under the Highway Beautification Act (HBA) codified at 23 U.S.C. 131. It clarifies the application of the Federal Highway Administration (FHWA) July 17, 1996 memorandum on this subject. This office may provide further guidance in the future as a result of additional information received through safety research, stakeholder input, and other sources.

Pursuant to 23 CFR 750.705, a State DOT is required to obtain FHWA Division approval of any changes to its laws, regulations, and procedures to implement the requirements of its outdoor advertising control program. A State DOT should request and Division offices should provide a determination as to whether the State should allow off-premises changeable electronic variable message signs (CEVMS) adjacent to controlled routes, as required by our delegation of responsibilities under 23 CFR 750.705(j). Those Divisions that already have formally approved CEVMS use on HBA controlled routes, as well as those that have not yet issued a decision, should re-evaluate their position in light of the following considerations. The decision of the Division should be based upon a review and approval of a State's affirmation and policy that: (1) is consistent with the existing Federal/State Agreement (FSA) for the particular State, and (2) includes but is not limited to consideration of requirements associated with the duration of message, transition time, brightness, spacing, and location, submitted for FHWA approval, that evidence reasonable and safe standards to regulate such signs are in place for the protection of the motoring public. **Proposed laws, regulations, and procedures that would allow permitting CEVMS subject to acceptable criteria (as described below) do not violate a prohibition against "intermittent" or "flashing" or "moving" lights as those terms are used in the various FSAs that have been entered into during the 1960s and 1970s.**

This Guidance is applicable to conforming signs, as applying updated technology to nonconforming signs would be considered a substantial change and inconsistent with the requirements of 23 CFR 750.707(d)(5). As noted below, all of the requirements in the HBA and its implementing regulations, and the specific provisions of the FSAs, continue to apply.

Background

The HBA requires States to maintain effective control of outdoor advertising adjacent to certain controlled routes. The reasonable, orderly and effective display of outdoor advertising is permitted in zoned or unzoned commercial or industrial areas. Signs displays and devices whose size, lighting and spacing are consistent with customary use determined by agreement between the several States and the Secretary, may be erected and maintained in these areas (23 U.S.C. § 131(d)). Most of these agreements between the States and the Secretary that determined the size, lighting and spacing of conforming signs were signed in the late 1960's and the early 1970's.

On July 17, 1996, this Office issued a Memorandum to Regional Administrators to provide guidance on off-premise changeable message signs and confirmed that FHWA has "always applied the Federal law 23 U.S.C. 131 as it is interpreted and implemented under the Federal regulations and individual Federal/State agreements.". It was expressly noted that "in the twenty-odd years since the agreements have been signed, there have been many technological changes in signs, including changes that were unforeseen at the time the agreements were executed. While most of the agreements have not changed, the changes in technology require the State and FHWA to interpret the agreements with those changes in mind". The 1996 Memorandum primarily addressed tri-vision signs, which were the leading technology at the time, but it specifically noted that changeable message signs "regardless of the type of technology used" are permitted if the interpretation of the FSA allowed them. Further advances in technology and affordability of LED and other complex electronic message signs, unanticipated at the time the FSAs were entered into, require the FHWA to confirm and expand on the principles set forth in the 1996 Memorandum.

The policy espoused in the 1996 Memorandum was premised upon the concept that changeable messages that were fixed for a reasonable time period do not constitute a moving sign. If the State set a reasonable time period, the agreed-upon prohibition against moving signs is not violated. Electronic signs that have stationary messages for a reasonably fixed time merit the same considerations.

Discussion

Changeable message signs, including Digital/LED Display CEVMS, are acceptable for conforming off-premise signs, if found to be consistent with the FSA and with acceptable and approved State regulations, policies and procedures.

This Guidance does not prohibit States from adopting more restrictive requirements for permitting CEVMS to the extent those requirements are not inconsistent with the HBA, Federal regulations, and existing FSAs. Similarly, Divisions are not required to concur with State proposed regulations, policies, and procedures if the Division review determines, based upon all relevant information, that the proposed regulations, policies and procedures are not consistent with the FSA or do not include adequate standards to address the safety of the motoring public. If the Division Office has any question that the FSA is being fully complied with, this should be discussed with the State and a process to change the FSA may be considered and completed before such CEVMS may be allowed on HBA controlled routes. The Office of Real Estate Services is available to discuss this process with the Division, if requested.

If the Division accepts the State's assertions that their FSA permits CEVMS, in reviewing State-proposed regulations, policy and procedures for acceptability, Divisions should consider all relevant information, including but not limited to duration of message, transition time, brightness, spacing, and location, to ensure that they are consistent with their FSA and that there are adequate standards to address safety for the motoring public. Divisions should also confirm that the State provided for appropriate public input, consistent with applicable State law and requirements, in its interpretation of the terms of their FSA as allowing CEVMS in accordance with their proposed regulations, policies, and procedures.

Based upon contacts with all Divisions, we have identified certain ranges of acceptability that have been adopted in those States that do allow CEVMS that will be useful in reviewing State proposals on this topic. Available information indicates that State regulations, policy and procedures that have been approved by Divisions to date, contain some or all of the following standards:

- Duration of Message
  - Duration of each display is generally between 4 and 10 seconds – 8 seconds is recommended.
- Transition Time
  - Transition between messages is generally between 1 and 4 seconds – 1-2 seconds is recommended.
- Brightness
  - Adjust brightness in response to changes in light levels so that the signs are not unreasonably bright for the safety of the motoring public.
- Spacing
  - Spacing between such signs not less than minimum spacing requirements for signs under the FSA, or greater if determined appropriate to ensure the safety of the motoring public.
- Locations
  - Locations where allowed for signs under the FSA except such locations where determined inappropriate to ensure safety of the motoring public.

Other standards that States have found helpful to ensure driver safety include a default designed to freeze a display in one still position if a malfunction occurs; a process for modifying displays and lighting levels where directed by the State DOT to assure safety of the motoring public; and requirements that a display contain static messages without movement such as animation, flashing, scrolling, intermittent or full-motion video.

Conclusion

This Memorandum is intended to provide information to assist the Divisions in evaluating proposals and to achieve national consistency given the variations in FSAs, State law, and State regulations, policies and procedures. It is not intended to amend applicable legal requirements. Divisions are strongly encouraged to work with their State in its review of their existing FSAs and, if appropriate, assist in pursuing amendments to address proposed changes relating to CEVMS or other matters. In this regard, our Office is currently reviewing the process for amending FSAs, as established in 1980, to determine appropriate revisions to streamline requirements while continuing to ensure there is adequate opportunity for public involvement.

For further information, please contact your Office of Real Estate Point of Contact or Catherine O'Hara (Catherine.O'Hara@dot.gov).

Scenic America

POSITION PAPER REGARDING THE PROPRIETY OF PERMITTING DIGITAL BILLBOARDS ON INTERSTATE AND FEDERAL-AID HIGHWAYS UNDER THE HIGHWAY BEAUTIFICATION ACT

State legislatures around the country are beginning to pass laws permitting the conversion of traditional static or tri-vision billboards to signs employing digital technology, generally in the form of electronic LED billboards. The outdoor advertising industry maintains that most states permit "changeable message signs," and therefore allow digital signs.

It is the position of Scenic America that this statement is inaccurate and unsupported. The Highway Beautification Act's unequivocal regulatory ban on flashing, intermittent, and changing lights is, per se, a ban on electronic signs. The Federal Highway Administration's 1996 policy permitting changeable message signs in the form of mechanical tri-vision signs was not blanket permission for electronic signs and cannot be used as a justification for allowing digital signs on federal-aid highways. Further, state legislative actions permitting these signs along Interstate or federal-aid highways are in violation of almost all existing federal-state agreements that govern implementation of the Highway Beautification Act (HBA).

The Act stipulates that states that do not adhere to the laws and regulations governing the application of the HBA are subject to penalties equal to ten percent of their federal highway funds.

* * *

Digital Billboards are "Intermittent" Lights, By Definition

Federal regulations and virtually all federal-state agreements ban billboards that employ "flashing, intermittent, or moving light or lights." This clear, long-standing policy is an explicit ban on current electronic display technologies, because all digital signs by definition employ intermittent lights, unless their images remain static, which virtually none do.

Digital billboards along Interstate and federal-aid highways are therefore impermissible.

Digital billboards, like other large LED displays, use as a "basic element . . . a trichromatic pixel that emits light of a required chromaticity using additive color mixing." [Source: Arturas Zukauskas, Introduction to Solid-State Lighting, 145 (2002)] When combined with other pixels, this process of additive color mixing allows for "1.0 to 68 million combinations of intensities, with millions of chromaticities and thousands of brightness levels possible." [Zukauskas, supra, at 145-46]

The change between displays occurs through the adjustment of individual green, blue, or red diodes within the thousands of pixels that make up such giant signs. [Source: "The Big Picture/Electronic Displays/Understanding Electronics/The Big Picture," downloaded from the website of YESCO.] Color changes are produced because variations in the color intensity of the red light, blue light, and green light provide a range of color intensity for the display itself. [Id. at 21.] For example, if a red light, blue light, and green light are all on at the same time it can generate a white light. If the blue light in a pixel were turned off but the green light and the red light remained on, the color yellow could be generated. Thus, if an array of

Used with permission of Scenic America.

the three colors of diodes in a single pixel changed from white to yellow after eight seconds, the blue light could be expected to change **intermittently** from "on" to "off" in every sense of the term.

Webster's Ninth New Collegiate Dictionary defines "intermittent" as "coming and going at intervals: not continuous." That is a precise description of how LED signs work. At *intervals* set to four, six, or eight seconds, depending on state and local laws, the LED's recombine their colored diodes and *the images come and go*. The fact that there is never a blank screen or that the image isn't animated doesn't change the fact that the lights on the sign are non-continuous.

No policy that bans "intermittent" lights can legitimately permit the erection of digital signs.

That, in fact, is the basis of the federal policy prohibiting these signs and reflects the explicit intent of Congress, making any attempt to place digital signs along federal highways a violation of the law, both in letter and spirit.

* * *

Congressional Intent

In 1978, under pressure from the industry, Congress reviewed the question of how electronic signs should be treated under § 131(c), and adopted a compromise. **Congress amended the law only to allow additional latitude for electronic *on-premises* signs, while leaving off-premises electronic signs (such as electronic billboards) subject to the long-standing categorization of these signs as belonging to a forbidden class.** FHWA regulations state that "[n]o sign may be permitted which contains, includes, or is illuminated by any flashing, intermittent or moving light or lights," [23 C.F.R. § 750.108 (c)].

Before the adoption of the Surface Transportation Assistance Act of 1978 [Pub. L. No. 95-599, 92 Stat. 2689], a House Committee noted that "the Department of Transportation has characterized as a flashing light electronic information displays which neither flash nor animate static information, but where the only movement is the periodic changing of information against a solid, colorless background." [Pub. L. 95-599, Surface Transportation Assistance Act OF 1978, H. Rep. 95-1485, August 11, 1978. at U.S. Code Cong. and Admin. News 6593.] In responding to this classification, Congress amended Section 131 to allow the addition of electronic signs to one of the existing exemptions from the general ban – **but not for off-premises signs**. As the so-called Wachtel and Netherton Report noted two years later:

> Nothing in the 1978 amendments relating to CEVMS [commercial electronic variable message signs] changed the status of these signs when used in off-premises advertising, either as directional signs or as general outdoor advertising in zoned or unzoned commercial and industrial areas. The national standards for these forms of signage prohibited use of flashing, intermittent or moving lights, and moving or animated parts; **<u>and FWHA interpreted CEVMS as falling within the scope of these prohibitions.</u>**

[Source: *Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage*, June1980, Federal Highway Administration Offices of Research & Development Environmental Division] (emphasis in underlining and bold added)

The outdoor advertising industry's creation of networks of off-premises electronic devices strategically postured along federal interstate highways ignores this important Congressional compromise by installing off-premises electronic devices as if they were entitled to the special protections that Congress specifically provided only to electronic devices installed on on-premises signs.

* * *

Tri-Vision Signs are Not Digital Signs

In justification for its position, the outdoor advertising industry often points to a July 17, 1996, Memorandum from the Director of the Office of Real Estate Services of the Federal Highway Administration to Regional Administrators (attached) that altered existing policy (erroneously, in our view) to state that "certain off-premise changeable message signs are consistent with State law and do not violate the lighting provisions of their State/Federal agreement." This decision was specifically precipitated by the industry's desire to allow tri-vision signs on federal roads. Tri-vision signs use rotating slats to change images at regular intervals, the timing of which is governed by state law. They are not digital or internally illuminated signs.

The outdoor advertising industry often cites this memorandum involving **tri-vision signs** as justification for allowing states to permit **digital signs utilizing intermittent lights and utilizing a technology that gives the appearance of flashing,** without having to change the existing agreements. This, however, is a selective reading of the memorandum. The memorandum states, "Changeable message signs are acceptable for off-premise signs, regardless of the type of technology used, ***if the interpretation of the State/Federal agreement allows such signs. In nearly all States, these signs may still not contain flashing, intermittent, or moving lights.***" [Emphasis added]

The July 17, 1996, memorandum is clear in saying that in order for a state to allow tri-vision and other changeable message signs the federal-state agreement must be formally interpreted to permit them (a process even a decade later few have bothered to undertake). Although the states are given a lot of leeway by this memorandum, which we believe is excessive in its surrender of the federal interest in beautification, it is not a blank check. Even with tri-vision signs there must be a determination that the federal-state agreement permits them. It's not automatic.

But ultimately the determination the memorandum makes about tri-vision signs doesn't matter anyway. The sentence about the interpretation of the agreement is not the controlling one in the context of digital signs; it's the sentence that follows that truly matters: **signs with flashing and intermittent lights are still banned**.

Despite industry claims to the contrary, **the 1996 memorandum is irrelevant to the new debate about digital signs.** The irrelevancy is due to the clear prohibition on flashing and intermittent lights contained in the federal-state agreements and as spelled out in FHWA's own policies that were explicitly referenced in the memorandum.

* * *

Digital Signs Violate Federal-State Agreements

Although we believe that federal law and regulations, as they are currently written, prohibit digital billboards, any state that disagreed with that interpretation or that wished to adjust their agreement's ban on "flashing and intermittent lights," would need to explicitly amend their federal-state agreements.

To our knowledge, no state has followed the procedure, thereby placing those states with digital billboard legislation in potential violation of their federal-state agreement and subjecting them to the ten-percent penalty, assuming they are not limiting the signs to state or local roads not subject to HBA regulation.

States that have submitted opinions to the FHWA on the permissibility of tri-vision or other non-digital changeable message signs under their agreements and state laws, cannot automatically assume that the same principles carry over to digital signs. **Permission from FHWA to put up tri-vision signs is not the same as permission to put up digital signs.**

As the Federal Highway Administration's own web page entitled, *A History and Overview of the Federal Outdoor Advertising Control Program,* states:

> There is increased interest in several States to allow the erection of off-premise commercial electronic variable message signs (CEVMS). **We have historically considered that the prohibition of flashing, intermittent, or moving light or lights in most of the various State/Federal agreements applies to all off-premise CEVMS regardless of message interval.**
>
> In summary, in deciding whether to allow off-premise signs using rotating slats, glow cubes, or moving reflective disks, the applicable State law and agreement should be interpreted on an individual State basis looking at customary use, and if applicable, Court interpretations.
>
> **Off-premise message center type signs using internal lighting are not yet approved for general off-premise application.**
>
> [Emphasis added]
>
> [Source: *http://www.fhwa.dot.gov/REALESTATE/oacprog.htm#TERMS*]

In other words, according to FHWA, electronic signs are not permitted because they clearly fall within the definition of "flashing, intermittent, or moving light or lights." Although tri-vision signs may be permitted if they meet the definition of "customary use" under state law, digital signs are considered another class of sign and are prohibited. The rules on tri-vision signs **do not carry over** to digital billboards, and so any attempt to use the 1996 memorandum as justification for permitting them under the HBA is completely inappropriate.

Although states have the right to go through the process of amending their agreement, any attempt to remove the ban on "flashing or intermittent lights," or attempts to interpret that language as not applying to digital signs, should be rejected by FHWA as an improper attempt to avoid federal regulations and a violation of the requirement that states maintain "effective control" over outdoor advertising on federal-aid highways. FHWA can do this by merely restating existing policies and need not break any new ground to deal with this issue.

In fact, FHWA's position was clearly stated in a letter dated March 15, 2006, from Robert M. Callan, Acting Division Administrator for the FHWA Texas Division, to Timothy C. Anderson, of the Right of Way Division of the Texas Department of Transportation. The letter was in response to a query by the Texas DOT asking for guidance on whether LED billboards were allowed under their federal-state agreement. They were told they were not.

Clearly, the Texas principles should apply to any state whose federal-state agreement is similarly worded, which is to say almost all of them. After quoting the relevant standard language in Texas' agreement about "flashing, intermittent, or moving light or lights," the letter concludes that "While the technology for LED displays did not exist at the time of the agreement, the wording in the agreement clearly prohibits such signs." In other words, the part of the federal-state agreement that applies to digital signs is the one about flashing and intermittent lights, and none other. FHWA seems to maintain that digital signs are, by definition, a form of "flashing, intermittent, or moving lights," otherwise that provision presumably wouldn't have been used as justification for rejecting electronic billboards in Texas.

* * *

The Process for Amending Federal-State Agreements

According to the FHWA letter to the Texas DOT, the process of amending the agreement requires the following steps:

1. A State must first submit its proposed change, along with the reasons for the change and the effects of such change, to the FHWA Division Office.
2. The Division and FHWA headquarters offices review and comment on the proposal.
3. If the concept is approved by the FHWA, the State must hold statewide public hearings on the proposed change in order to receive comments from the public.
4. If the State then wishes to amend the agreement, it must submit to the FHWA: (a) The justification for the change; (b) The record of hearings and; (c) An assessment of the impact.
5. Then, these are summarized and published in the Federal Register for comments.
6. Comments on the proposed amended agreement will then be evaluated by the FHWA.
7. The FHWA will then decide if the agreement should be amended as proposed and will publish its decision in the Federal Register.

This process is extensive and requires major public participation precisely because changes to the agreements have significant ramifications both for communities and the federal interest in the beautification of the highways. The transformation of the very nature of billboards from static or mechanical devices to electronic signs is of great importance and cannot be undertaken without the kind of full public examination of the issue that is embodied in the process outlined above.

* * *

Why Digital Signs are Banned

It is important to understand what it is about signs with "flashing and intermittent lights" that puts them in a prohibited class. The distinguishing trait of intermittent light is that it can vary while a driver watches it, in a setting in which that variation is likely to attract the drivers' attention away from the roadway. Because that is the mischief at which the prohibition is directed, it makes no sense to conclude that the existing rule is inapplicable to new technology simply because it is new, or to have the meaning of the federal prohibition vary depending on whether other terms are present in the state-federal agreement. Thus, the industry's position violates both the purpose (as well as the intent) of existing federal law.

The underlying principle is simple: These signs, particularly those using modern display technologies, are prohibited because they pose potential hazards to the motoring public.*

* * *

The Law, Rules, Legislative History, And Administrative Record Are Quite Clear And The Conclusions Unequivocal

- Digital signs along Interstate and federal-aid highways are explicitly governed by the regulations prohibiting "flashing, intermittent, or moving light";
- Digital signs are not in the same class of changeable message sign as tri-vision signs and rules governing tri-vision signs do not apply;

- The clear intent of Congress was to continue the prohibition on off-premise electronic signs, even after the alterations in the law made in 1978;

- The 1996 memorandum regarding tri-vision and changeable message signs is not an implicit or explicit justification for permitting digital signs and in fact is an unequivocal restatement of policies prohibiting them;

- Even though the regulations currently prohibit digital signs, states seeking to permit them would need to attempt to formally amend their federal-state agreements with the Federal Highway Administration and follow the procedures outlined in the Texas letter;

- The FHWA should unequivocally reject any effort to amend federal-state agreements to permit digital signs due to their violation of the long-standing ban on flashing and intermittent lights, which is rooted in fundamental and unalterable principles of highway safety and beautification;

- States that have passed legislation permitting digital signs on Interstate and federal-aid highways are in violation of their federal-state agreements and are subject to a penalty of ten percent of their federal highway funds; and,

- The federal government should act quickly and unambiguously in this matter and should not surrender its regulatory authority to the states and permit individual states to interpret federal statutes and rules without constraint. States that have passed digital sign legislation should be notified that they are in violation of their agreement before large numbers of digital signs are erected on federal-aid highways, all of which would need to be deemed nonconforming.

Kevin E. Fry
President, Scenic America
1634 I Street, N.W., Suite 510
Washington, DC 20006
202.638.0550, ext. 11
fry@scenic.org

* For a fuller explanation of the safety issues inherent in these signs, see Scenic America's 2007 publication, *Billboards in the Digital Age: Unsafe and Unsightly at Any Speed*, available at www.scenic.org.

Exhibits:
Memorandum, July 17, 1996, from the Director, Office of Real Estate Services, Federal Highway Administration, to Regional Administrators re: Off-Premise Changeable Message Signs

Letter, March 15, 2006, from Robert M. Callan, Acting Division Administrator, Federal Highway Administration, to Timothy C. Anderson, Right of Way Division, Texas Department of Transportation

07/05/07

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: INFORMATION: Off-Premise Changeable Message Signs

Date: JUL 17 1996

From: Director, Office of Real Estate Services

Reply to Attn. of: HRE-20

To: Regional Administrators

A number of States are taking the position that certain off-premise changeable message signs are consistent with State law and do not violate the lighting provisions of their State/Federal agreement. The State of Georgia recently amended its State law to allow off-premise signs having panels or slats that rotate provided they meet State criteria for frequency of message change and spacing. The State of Oklahoma recently considered amending its State law to also allow these signs. Because of the increased use of changeable message signs, we believe it is timely to restate our position concerning these signs.

The Federal Highway Administration (FHWA) has always applied the Federal law 23 U.S.C. 131 as it is interpreted and implemented under the Federal regulations and individual State/Federal agreements. Because there is considerable variation among the States, the importance of these agreements cannot be overstated. In the twenty-odd years since the agreements have been signed, there have been many technological changes in signs, including changes that were unforeseen at the time the agreements were executed. While most of the agreements have not changed, the changes in technology require the State and FHWA to interpret the agreements with those changes in mind. Changeable message signs are acceptable for off-premise signs, regardless of the type of technology used, if the interpretation of the State/Federal agreement allows such signs. In nearly all States, these signs may still not contain flashing, intermittent, or moving lights.

The FHWA will concur with a State that can reasonably interpret the State/Federal agreement to allow changeable message signs if such interpretation is consistent with State law. The frequency of message change and limitation in spacing for these signs should be determined by the State. This interpretation is limited to conforming signs, as applying updated technology to nonconforming signs would be considered a substantial change and inconsistent with 23 CFR 750.707(d)(5).

Barbara K. Orski

FHWA:HRE-20:RPHarter:gs:62026:June 24, 1996
cc: Reader Chron HRE-20
G:\12\RPH\CMS.110

Scenic America

Texas Department of Transportation

P.O. BOX 5075 • AUSTIN, TEXAS 78763-5075 • (512) 416-2901

March 10, 2006

RECEIVED
AUG 14 2006
TEXAS DIV.
FHWA

Robert M. Callan
Acting Division Director
Federal Highway Administration – Texas Division
300 East Eighth Street, Room 826
Austin, Texas 78701

Dear Mr. Callan:

Recently, outdoor advertising providers have approached the Texas Department of Transportation ("TxDOT") regarding the use of light-emitting diode ("LED") displays on Interstate and Federal-Aid highways. The 1972 Federal-State Agreement ("Agreement") executed by the Federal Highway Administration ("FHWA") and TxDOT states in pertinent part:

> F. Lighting: Signs may be illuminated, subject to the following restrictions:
>
> 1. Signs which contain, include or are illuminated by any flashing, intermittent or moving light or lights are prohibited...

Since the technology necessary for LED displays did not exist at the time of the Agreement, TxDOT requests guidance from the FHWA regarding whether the use of such displays violate the Agreement. Should you be unfamiliar with this technology, an outdoor advertising company has provided a DVD on such displays which I will be glad to forward to you.

Should the FHWA determine that such displays currently violate the Agreement, TxDOT is considering applying to the FHWA to amend the Agreement. In your response to the above, could you provide an outline of the steps necessary for such an amendment?

Thank you for your assistance. If you have any questions, please do not hesitate to contact me at (512) 416-2926.

Sincerely,

Timothy C. Anderson

Timothy C. Anderson, Esq.
Right Of Way Division
Texas Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

J.J. Pickle Federal Building
300 E. 8th Street, Room 826
Austin, Texas 78701

March 15, 2006

In Reply Refer To: HPP-TX

LED Displays
Texas Federal/State Agreement

Mr. Timothy C. Anderson, Esq.
Right of Way Division
Texas Department of Transportation.
P.O. Box 5075
Austin, Texas 78701

Dear: Mr. Anderson:

This letter is in response to your letter dated March 10, 2006 requesting guidance from FHWA regarding the use of light-emitting diode (LED) displays on Interstate and Federal-Aid highways in Texas. In particular your letter requested FHWA's determination whether the use of this type of display is in violation of the 1972 Federal-State Agreement executed by the Federal Highway Administration and TxDOT.

The Highway Beautification Act (HBA) directs the US Secretary of Transportation to enter into agreements with each State to determine the limits or specifications for size, spacing and lighting of outdoor advertising signs in commercial and industrial areas (see 23 U.S.C. § 131(d)). These agreed-upon limits were supposed to be "consistent with customary use" within the State.

The Texas/ Federal Agreement executed pursuant to §131(d) on May 2, 1972, prohibits signs which contain, include or are "illuminated by any flashing, intermittent or moving light or lights.... except those giving public service information such as time, date, temperature, weather or similar information." The State has always abided by the terms of the agreement. As you are aware, the Texas Administrative Code, Rule 21.154, addresses lighting and movement of signs. Section 21.154 (a) (1) states; Signs may be illuminated except for signs that contain, include, or are illuminated by any flashing, intermittent, or moving light or lights, including any type of screen using animated or scrolling displays, such as LED (light emitting diode) screen or any other type of video display, even if the message is stationary, except those giving only public service information such as time, date, temperature, weather, or similar information.

While the technology for LED displays did not exist at the time of the agreement, the wording in the agreement clearly prohibits such signs. After careful consideration and review of your request for guidance, the FHWA Texas Division has determined that such displays do not conform to the existing Texas/ Federal Agreement.

Celebrating 50 Years 1956 2006 Eisenhower Interstate System

BUCKLE UP AMERICA

Timothy C. Anderson, Esq.

March 15, 2005

As you requested, outlined below is the process to amend a Federal-State Agreement:

1. A State must first submit its proposed change, along with the reasons for the change and the effects of such change, to the FHWA Division Office.
2. The Division and FHWA headquarters offices review and comment on the proposal.
3. If the concept is approved by the FHWA, the State must hold statewide public hearings on the proposed change in order to receive comments from the public.
4. If the State then, wishes to amend the agreement, it must submit to the FHWA:
   a. The justification for the change
   b. The record of hearings and
   c. An assessment of the impact.
5. Then, these are summarized and published in the Federal Register for comments
6. Comments on the proposed amended agreement will then be evaluated by the FHWA.
7. The FHWA will then decide if the agreement should be amended as proposed and will publish its decision in the Federal Register.

The FHWA would certainly entertain a request by a State to amend the State/Federal agreement pertaining to §131(d) signs, but the FHWA would have to determine if a proposed change was consistent with the HBA and its implementing regulations found at 23 CFR Part 750. In the past fifteen years, there have been amended agreements with two States, Nevada and Oregon. As you can see, it is not a common practice.

I hope that this letter clearly sets forth the FHWA's position on the matter.

Sincerely,

Robert M. Callan
Acting Division Administrator

SCOTTISH EXECUTIVE

External-To-Vehicle Driver Distraction

Transport Research Series

Transport Research Planning Group

social research

EXTERNAL-TO-VEHICLE DRIVER DISTRACTION

Dr Brendan Wallace

HFAL

Scottish Executive Social Research
2003

Used with permission of the author and the Scottish Government.

Further copies of this report are available priced **£5.00**. Cheques should be made payable to The Stationery Office Ltd and addressed to:

The Stationery Office Bookshop
71 Lothian Road
Edinburgh
EH3 9AZ

Tel: 0870 606 5566
Fax: 0870 606 5588

The views expressed in this report are those of the researcher and do not necessarily represent those of the Department or Scottish Ministers.

© Crown Copyright 2003
Limited extracts from the text may be produced provided the source is acknowledged. For more extensive reproduction, please write to the Chief Research Officer at the Office of Chief Researcher, 3rd Floor West Rear, St Andrew's House, Edinburgh EH1 3DG

Used with permission of the author and the Scottish Government.

CONTENTS

EXECUTIVE SUMMARY **I**

CHAPTER ONE INTRODUCTION **1**

BACKGROUND 1
DESCRIPTION AND PURPOSE OF THE REPORT 1
METHODOLOGY 1
STRUCTURE OF THE REPORT 2
AIMS AND OBJECTIVES 2

CHAPTER TWO DRIVER DISTRACTION **3**

STUDIES OF DISTRACTION 3

CHAPTER THREE THEORY **7**

AROUSAL THEORY 7
BROADBENT'S 'FILTER' THEORY 9
PERCEPTION AND PSYCHOPHYSICS 11
AROUSAL AND UNDERAROUSAL 15
SPECIFIC VEHICLE AND VISION BASED EXPERIMENTS 15
CONCLUSION 19

CHAPTER FOUR STUDIES OF DRIVER DISTRACTION AND WHAT THEY FOUND **20**

KINDS OF DATA: U.S. DATABASES 20
THE INDIANA STUDY 21
AAA STUDY 22
THE SUSSMAN STUDY 26
WANG KNIPLING AND GOODMAN 27
WIERVILLE AND TIJERINA 27
STEVENS AND MINTON 28
THE KOSTYNIUK-EBY STUDY 30
FIFE CONSTABULARY 30
CENTRAL SCOTLAND POLICE ROAD ACCIDENT DATABASE 31

CHAPTER FIVE INTERNAL TO VEHICLE DISTRACTION: MOBILE PHONES **34**

KINDS OF STUDIES 34
LAB STUDIES 35
EPIDEMIOLOGICAL STUDIES 35

CHAPTER SIX EXTERNAL TO VEHICLE DRIVER DISTRACTION **37**

AGE AND EXTERNAL TO VEHICLE DRIVER DISTRACTION 37
ROAD TYPE AND EXTERNAL TO VEHICLE DRIVER DISTRACTION 38
WEATHER AND EXTERNAL TO VEHICLE DRIVER DISTRACTION 39

CHAPTER SEVEN SPECIFIC STUDIES: BILLBOARDS **41**

THE LEGAL POSITION 41
THE STUDIES 42
THE NORTH CAROLINA STUDY 42

Used with permission of the author and the Scottish Government.

THE ADY STUDY 43
MADIGAN-HYLAND 44
NEW JERSEY GARDEN STATE PARKWAY 45
INFORMAL, SMALL SCALE STUDIES 46
MCMONAGLE (MICHIGAN) STUDY 46
HOLOHAN FIELD BASED ANALYSIS 47
OREGON STATE HIGHWAY 49
MINNESOTA RURAL TRUNK HIGHWAY 49
THE RUSCH STUDY 50
VERSACE 51
EXPERIMENTAL STUDIES 52
JOHNSTON AND COLE 52
HOLOHAN 53
CONCLUSIONS 54

CONCLUSIONS **56**

ANNEX ONE **REFERENCES** **58**

ANNEX TWO **SEARCH METHODOLOGIES** **74**

GLOSSARY **76**

Used with permission of the author and the Scottish Government.

LIST OF TABLES/FIGURES

FIGURE 3.1: THE 'YERKES-DODSON' LAW 7
TABLE 4.1 22
TABLE 4.2 22
TABLE 4.3 25
TABLE 4.4 27
TABLE 4.5 29
TABLE 4.6 29
TABLE 4.7 30
TABLE 4.8 30
TABLE 4.9 31
TABLE 4.10 32
TABLE 6.1 37
TABLE 6.2 38
TABLE 6.3 39
TABLE 6.4 40

Used with permission of the author and the Scottish Government.

EXECUTIVE SUMMARY

1. This report presents the findings of a literature review of all available literature published in English since 1945 on the subject of external-to-vehicle driver distraction. The report was carried out by Human Factors Analysts Ltd. (HFAL) on behalf of the Scottish Executive between December 2002 and March 2003. The research consisted of three main elements. First, a general review of the literature pertaining to driver distraction. Second, a review of literature specifically concentrating on external-to-vehicle distraction. And finally, a review of literature pertaining to billboards and signs as an external distracter, in an attempt to discover whether there is evidence that billboards and signs are a contributory factor to road accidents.

Scientific Evidence on Driver Distraction.

2. There is a considerable body of scientific evidence to support the hypothesis that drivers can become distracted while they drive. The available literature suggests that there are two main elements to this: cognitive overload and cognitive underload. In terms of cognitive overload, the evidence suggests that when too much information is made available in certain situations the driver may become confused and have an inadequate amount of time to process the available information. In terms of cognitive underload, it seems that drivers (especially on long, boring trips), may cease to pay attention to the road, and may therefore become prone to distraction.

3. There are numerous studies that suggest that attentional/distraction problems are a major contributory factor to accidents. There are numerous individual differences/external factors influencing the likelihood of being distracted.

4. Information from accident databases suggest that external-to-vehicle driver distraction is a major contributory factor in road accidents. However, it is likely that external-to-driver distraction events are under-reported. This is because distraction is likely to be unconscious (and therefore unlikely to be consciously remembered and then put as a contributory factor on accident investigation forms), and also because there are social and legal pressures that make it less likely that 'distraction' will be admitted by drivers as being a contributory factor to the accident. Therefore it is almost certain that it is a larger problem than is commonly believed.

5. There seem to be two main features of distraction. As noted above, there is overwhelming evidence that drivers can become 'confused' by visual 'clutter' in some circumstances. This is caused by having to search through the whole 'visual field' in situations where the environment contains a great deal of distracting information. Statistical and experimental evidence suggests that this kind of distraction is most likely to occur at busy junctions.

6. There is also evidence that distraction can be associated with cognitive underload, and that drivers may become easily distracted in situations where there are low levels of information available in the external environment (for example motorways, possibly in conditions of low light). Drivers may then fixate on external lights/signs and drive off the road, or else may be particularly prone to being 'caught by surprise' by unexpected

Used with permission of the author and the Scottish Government.

distracters. Statistical evidence suggests this may occur on sharp bends following long stretches of 'boring' road, amongst other places.

7. There are a number of correlation studies and experimental studies which demonstrate that drivers can be distracted by signs/billboards. None of these studies are conclusive, and there are a number of issues (especially concerning the 'correlation does not imply causation' rule with the statistical studies and 'ecological validity' with the laboratory studies) which mean that this finding should be viewed with a certain amount of caution. Nevertheless the case for arguing that visual 'clutter' at junctions (associated with billboards and signs) can lead to unsafe driving is very strong. However more research is needed on specific cases (especially in Scotland) to demonstrate the extent of the effect.

8. The evidence that advertising and signs can function as distracters in conditions of information 'underload' is less strong but still compelling. More research is therefore needed on this subject, given the rate at which outdoor advertising is proliferating.

1. It seems likely that young drivers (17-25) and older drivers (over 65) are particularly prone to distraction. However, older drivers seem to compensate for reduced driving ability by taking more care with their driving and driving less often, so this effect tends not to show up in accident statistics.

10. It must be stressed that despite the potential seriousness of external-to-vehicle distraction, most of the research has been carried out some considerable time ago (as far as we are aware, there has been only one research project on this topic since 1980). Moreover, almost all the research has been carried out in the United States or Australia. With the exception of two specific investigations of accident databases detailed in this report, there is (to the best of our knowledge) *no* published research on this subject carried out in Scotland.

Conclusions

11. The literature review found that driver distraction is a serious problem in road safety. It identified both internal-to-vehicle distraction and external-to-vehicle distraction as serious problems. External-to-vehicle distraction is likely to be under-reported, and seems likely to be a larger contributory factor than is commonly stated. It seems highly likely that billboards are a major contributory factor to such distraction incidents. However, almost all of the existing (available) studies were carried out before 1980, and none were specific to Scotland.

12. Implications for further work in this area include: carrying out specific research on what kinds of billboards and signs can create visual 'clutter' on junctions, showing what distraction effects this can have and the effect this has on safety; investigation of the effect of under arousal on driving ability and distraction; and more empirical research on specifically Scottish issues relating to distraction.

Used with permission of the author and the Scottish Government.

CHAPTER ONE INTRODUCTION

BACKGROUND

1.1 Human Factors Analysts Ltd. (HFAL) was asked by the Scottish Executive Central Research Unit to conduct a literature review on the subject of external-to-vehicle driver Distraction in October 2002. It was written between 1st December 2002 and 25th March 2003. HFAL is an independent consultancy associated with the University of Strathclyde.

1.2 The subject of external-to-vehicle driver distraction is an important one. The urban environment is becoming increasingly complex, and increasingly filled with objects that may function as distractors, such as buildings, satellite dishes, vegetation, and displays and advertisements on buses, taxis, billboards and bus stops. Moreover, advertising (whether on billboards or in any other format) is becoming increasingly prevalent, noticeable and explicit, as advertisers try harder and harder to attract our attention. If it is true that external-to-vehicle driver distraction has a connection to accident rates, it is vitally important that the nature of the link is discovered, such that the appropriate countermeasures can be taken.

DESCRIPTION AND PURPOSE OF THE REPORT

1.3 This is a literature review of all available literature (that was procurable within the available time period) published in English in refereed academic journals between 1945 and the present. There were three levels of analysis. Firstly, research was carried out on the subject of driver distraction in general, considering statistical studies, experimental studies, qualitative studies and laboratory studies. This was not intended to be exhaustive but was merely an attempt to provide a broad overview of the subject.

1.4 Secondly, research was carried out on the subject of internal-to-vehicle driver distraction and its relation to external-to-vehicle driver distraction. The purpose of this was to discover the ratio of driver distraction: that is, whether external-to-vehicle driver distraction or internal-to-vehicle driver distraction posed the greater threat to road safety.

1.5 Finally a literature review was carried out specifically on the effects of billboards and signs as a distracter to drivers. It should be noted that this aspect of the research *was* intended to be exhaustive, in that an attempt was made to identify all the research pertaining to this subject that met the criteria in 1.3, above. Research that was not included in this report was either unobtainable, or else could not be obtained within the requisite time period.

METHODOLOGY

1.6 A number of 'user groups' were joined on the internet, and requests made for any information that might be useful in this context. On the basis of this, and from a search of the World Wide Web, names of relevant authorities were identified, who were then emailed and asked if they knew of any relevant information. At the same time, the academic databases available through the University of Strathclyde were searched. Finally a search was carried out on the World Wide Web for any relevant articles or papers. More details of the methodology used are contained in Annex Two.

Used with permission of the author and the Scottish Government.

STRUCTURE OF THE REPORT

1.7 Chapter Two begins with a discussion of research methodologies used in the field. Chapter Three carries on to give a general description of psychological theory relevant to this subject. These include the arousal theory of Hebb (1955), and the 'filter' theory of Broadbent (1958). These are discussed and evaluated. Then there is a discussion of contemporary psychological views of vision, perception and attention, and how these findings relate back to the Hebb's and Broadbent's theories. Other factors relating to distraction (such as age and fatigue) are mentioned.

1.8 Chapter Four contains descriptions of the main accident databases available for analysis, and results from the various studies that have been carried out using them. What these studies have to say about external-to-vehicle distraction and its relation to internal-to-vehicle distraction is examined. A 'case study' of mobile phone use and its relation to traffic accidents follows in Chapter Five.

1.9 There follows a general description of factors affecting external-to-vehicle distraction, and then (in Chapter Seven) a more specific discussion of the effects of billboards on traffic accidents. All available studies are discussed and evaluated. In Chapter Eight Conclusions are drawn and recommendations given.

AIMS AND OBJECTIVES

1.10 The aim of the report is to describe the existing literature relating to driver distraction. Specifically it is an attempt to show how large a problem the literature states that external-to-vehicle distraction is. The report concentrates on billboards and signs as a possible cause of external-to-vehicle driver distraction. If it was discovered that billboards and signs were a major contributory factor to road accidents this may have implications for policies and guidelines produced by the Scottish Executive and other governing bodies.

Used with permission of the author and the Scottish Government.

CHAPTER TWO DRIVER DISTRACTION

2.1 Driver Distraction has been defined as 'a shift of attention away from stimuli critical to safe driving towards stimuli that are not related to safe driving' (Streff and Spradlin, 2000: 1). Two major distinctions tend to be made in the literature: between internal-to-vehicle distraction and external-to-vehicle distraction. Internal vehicle distraction includes everything inside the car (including the driver's own actions), so it covers everything from distraction from the car radio/CD player, distraction from other passengers, distraction from use of mobile phones (or other in-car communication system), and the driver 'distracting him/her self' (for example, by day dreaming).

2.2 By the same token, external-to-vehicle distraction includes everything outside the car, from weather conditions to billboards to children playing and so forth. Most (but not all) external-to-vehicle distraction will tend to be visual (as a result of the enclosed nature of the modern motor vehicle), and most internal-to-vehicle distraction will tend to be audible (although of course there are exceptions. It is arguable that, for example, police/ambulance sirens may distract drivers. Cf. Withington, 1998).

2.3 It should be noted that most of the studies discussed in this report originate from the United States. Studies in other countries will be noted where available. However, the fact that there are cultural differences between countries (for example, in this study, between the kinds of advertisements permitted, and their prevalence) should be borne in mind. Just because something has been demonstrated to be the case in one country, it does not necessarily follow that it is the case in another.

STUDIES OF DISTRACTION

2.4 There are a large number of ways to study driver distraction. However, most attempts are of four major kinds.

1: Laboratory studies.

2: Statistical/epidemiological studies
- 2:1 Correlation studies
- 2:2 Double blind experiments

3: Questionnaire/verbal discourse studies

4: Focus group/interview studies.

2.5 These are of course not mutually exclusive. For example, laboratory studies may be of the double blind variety, and there is obviously an overlap between discourse studies and focus groups. However, with the examples below, the differences should become obvious.

2.6 It should be noted that these studies break down into two main types: quantitative and qualitative (that is studies involving numbers versus studies involving discourse) with 1 and 2 being quantitative and 3 and 4 being qualitative. This of course refers to method of input of data, not necessarily that of storage and analysis. So for example, a questionnaire form will

Used with permission of the author and the Scottish Government.

be analysed as quantitative data (assuming questions are of the 'yes' 'no' variety, or questions in which subjects are asked to rate things on a scale). However, it should not be forgotten that the input is still discourse, albeit discourse notated in the form of quantitative data.

2.7 The next four sections will describe the various methods of analysis, and discuss advantages and disadvantages of these methods.

Laboratory Studies

2.8 An example of a laboratory experiment would be an experiment conducted in a driving simulator in which (for example) simple driving tests were carried out and response times measured while a 'distracter' (which might be in visual or audio form) was introduced. Response times to the tests with and without the distracter could then be compared. If they were slower in the presence of the distracter then we might infer that the distracter was interfering with driving responses.

2.9 In terms of scientific practice it should be noted that laboratory experiments are generally considered to be the most reliable form of evidence. However the problem always remains of generalising from lab experiments to a real world situation. This is particularly the case when the experiments are more abstract studies of perception (for example noticing dots on a computer screen). This is known as the problem of **ecological validity.**

Statistical Studies

Correlation Studies

2.10 These are studies carried out 'in the field'. For example if we wished to study the effects of billboards on driver behaviour we could take a list of all the accidents in the general area and see if we can correlate them with areas with high numbers of billboards. Alternatively if we were studying the effects of mobile phones we could obtain mobile phone records and see if there was a correlation between the time that drivers were using their phones and when an accident took place.

2.11 It is important that controls are included in these types of study (so in the first example we should attempt to correlate accidents to billboards in an area with a low number of billboards as well, and compare the statistics of the two areas to show we have a genuine effect).

2.12 However even if a control is used, there are still two main problems with these sorts of studies. Firstly there is the difficulty of obtaining accurate statistical data. For example, in the mobile phone studies above, it is difficult to get data accurate enough to show that drivers were using their mobile phones at the actual time of the accident.

2.13 Secondly, and more profoundly, there is the problem that 'correlation does not imply causation'. Even if we found a perfect correlation between billboard numbers and accident rates, this does **not** prove that billboards cause accidents. There may be some hidden variable that links the two. For example, there is a correlation between accidents caused by SPADs

Used with permission of the author and the Scottish Government.

(Signals Passed at Danger) on the UK Railways, and the presence of bananas in the supermarkets. But this does not mean one causes the other. Instead there is a hidden factor (sunlight/summer) linking the two. The more sunlight there is the more likely drivers are to SPAD, and the more likely there are to be bananas in the shops. In the same way, billboards may exist for a reason (for example, a greater number of shops, and, hence, a greater number of cars pulling out into the road), and it may be this reason that is the 'hidden' causal factor linking billboards and accidents.

Before and After Studies

2.14 Again using the example of a billboard, a before and after study would take accident data from an area before a billboard was installed and then after the billboard was installed. If the billboard was having an effect then it would be expected that the accident rate would go up. In an ideal world the billboard would then be removed and the rate would go down again. It should be stressed that before and after studies must have two forms of control. Firstly, another area, as similar as possible, must also have its accident rate analysed to show that the effect was really caused by the billboard. Secondly, the whole surrounding area must be studied to show there is no effect of 'accident migration' (the still controversial theory that lowering the accident rate in one area merely 'displaces' the accidents and leads to them taking place elsewhere).

2.15 Before and after studies are by far the best way of demonstrating a 'real world' effect. However, they are difficult to conduct (especially, for example, if one thinks of the effect of safety warning signs, mobile phones, or adverts on taxis). Moreover, experimental procedures in this area tend to be lax. Elvik (1997) performed a meta-analysis of 36 'before and after' studies concerning accident reduction strategies. He discovered that few of the studies had allowed for four aspects of traffic behaviour:

1. Changes in traffic volume
2. General trends in the number of accidents
3. Regression to the mean
4. Accident migration.

2.16 It is point 3 that particularly applies in this case. There are random statistical variations in data, and without adequate controls it is possible to mistake these fluctuations for genuine 'causal' effects. For example, in a two-year study, if a billboard was erected at the end of year 1, and traffic fatalities went up, it would be easy to conclude that the billboard 'caused' these fatalities. But it may well have been that the fatality rate for year 1 was unusually low, and that the increase was simply a 'regression to the mean' effect, not a causal one.

Questionnaire Data

2.17 These kinds of study usually consist of questionnaire data filled in by the police or some other official as to the causes of the accident. They may be based on an interview with the driver or the official's own guess as to what happened. It is important to note that there is no fixed methodology for questionnaire data and that, therefore, methodologies can vary. For example, in some instances drivers are interrogated by the police and specifically asked (for

Used with permission of the author and the Scottish Government.

example) whether they were distracted. Sometimes however the police merely have a form to fill in, and do not tick the 'driver distracted' box unless the driver volunteers the information. It is therefore important to ensure that similar methodologies were used in data gathering before comparing datasets. Unfortunately information relating to this is not always freely available.

2.18 It is important to note that despite the fact that the method of analysis for this kind of Study (output) is quantitative, *input* is qualitative. That is, all that is being analysed is discourse (usually from the driver) which is logged on paper and then on a database. It is possible that the causal explanations produced by drivers for their own behaviour are influenced by social factors (for example, stress, anger, fear of prosecution) as much as by a desire to tell 'the truth'. For example, a private citizen writing in the NHTSA internet forum on driver distraction wrote: 'Today, I heard that 25% of accidents were caused by driver distraction. I question that because of a wreck I once had. I was busy lighting a cigarette when I crashed into someone. Of course, I chucked the cigarette immediately and when the police came, I told them I "just didn't see the guy." If the same thing happened when I was fiddling with GPS device or whatever, I probably wouldn't admit that either. I think the statistics about accident causes should be viewed with some suspicion.' (NHTSA, 2000: In Vision Technologies: Experience and Research (Other) 'Question Those Statistics'). On the basis of this quote, the idea that qualitative input to statistical databases is *necessarily* veridical must be questioned.

Focus Groups/Interview

2.19 This is perhaps the most obvious way of gaining information about driver distraction: to ask the drivers themselves why they become distracted. However, to the best of our knowledge no studies of this sort have been carried out in this field (with one exception: see section 4.42), perhaps due to fears that the information proffered will be 'subjective'. However it should be noted that interview (questionnaire) data are just as subjective (and perhaps more so, considering the situations in which they are obtained).

Summary

2.20 There are four major methods of gaining information about driver distraction.

- **Experiments**
- **Before and After Studies**
- **Questionnaire Studies**
- **Focus Groups**

All of these have advantages and disadvantages.

Used with permission of the author and the Scottish Government.

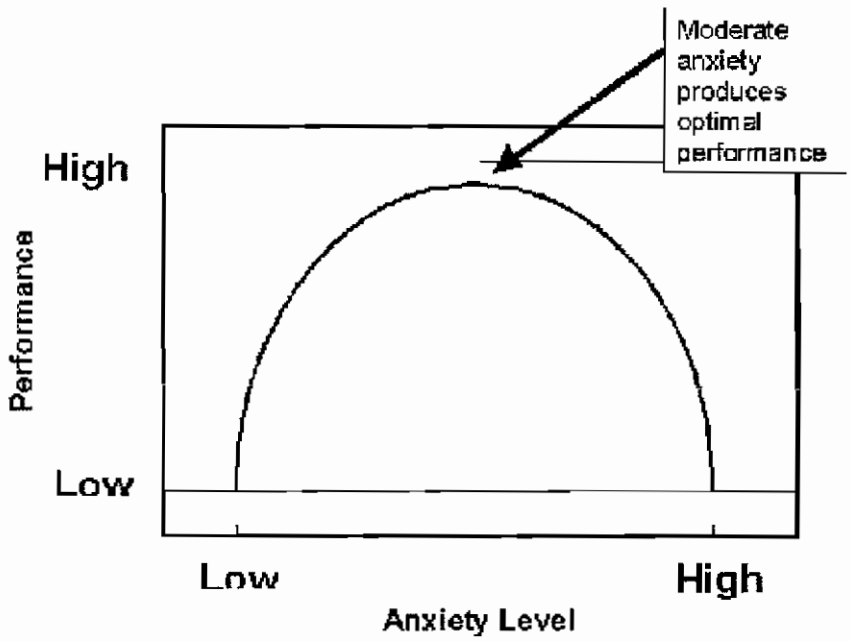
CHAPTER THREE THEORY

3.1 Psychological theory relating to driver distraction is derived from psychological theories of *attention*.

AROUSAL THEORY

3.2 The first major theory of attention in modern psychology was stated by Donald Hebb in 1955. Hebb stated that attention was a function of *arousal*. 'Arousal' has a technical definition in psychology. However, it means roughly the same as the words 'excited' or 'interested' in ordinary language. It is a physiological state, which can be measured quantitatively (via EEG measurements, moisture levels on skin and other methods). Hebb's theory was an adaption of the Yerkes-Dodson (Yerkes and Dodson, 1908) law, and stated that **human beings seek out an optimal level of arousal**. Too low a level of arousal ('anxiety') would lead to a situation of boredom. Too high a level of arousal ('anxiety') would lead to a state of stress. This can be shown in graphic form in figure 3.1, below.

Figure 3.1: The 'Yerkes-Dodson' Law



3.3 Other psychologists have demonstrated that the situation is rather more complex than this basic model would allow. For example, it has become clear that the level of arousal we seek varies over time. In the morning, when we wake up, we only want low levels of arousal (quiet music, a coffee). In the evening we will tend to want more arousal (a walk, perhaps a movie, or a restaurant). When going to sleep at night, we will wish for lowered arousal again. Moreover there are probably individual differences in the amount of arousal we seek as well. Some people (termed 'sensation seekers') seem to seek high levels of arousal and

Used with permission of the author and the Scottish Government.

will tend to make lifestyle choices accordingly (for example, in becoming professional gamblers, or pursuing 'extreme sports') (Zuckerman, 1979).

3.4 Earlier in the twentieth century the Russian psychologist Pavlov had noted what he termed the Orientation Reaction (OR) (Pavlov, 1927). This is the reaction of an animal to unanticipated stimulus. The Canadian psychologist D.E. Berlyne describes a few of the features of this reaction as follows: 'The pupil of the eye dilates....the eyes open wide and turn toward a source of visual stimulation...the head turns towards a source of sound' (Berlyne, 1960: 81). It was Berlyne who first linked the OR to arousal theory on the one hand and information theory on the other. Information theory (as defined by Shannon, 1948), stated that information could be quantified (in terms of how many 'bits') it contained. Berlyne's innovation was to see that **information could modify arousal**. So for example, if we are underaroused, we can seek information (read a newspaper, pick up a book, watch television) to raise our arousal levels. On the other hand, if there is 'too much information' (for example, if we are asked to perform a task for which we are inadequately trained) we will attempt to lower our levels of arousal (Shinar et al. 1978: 18. cf. also Matthews et al, 1996).

3.5 Berlyne's work was mainly concerned with discovering what kind of information had what kind of effect on arousal. Here he made a number of discoveries, three of which are particularly relevant to the present study.

Novelty

3.6 In experiments, Berlyne discovered that information that was 'novel' (in a way that could be defined in terms of Shannon's theory) was both more likely to raise arousal and more likely to provoke the Orientation Reaction. For example, in one experiment, pictures of animals were projected on a screen for ten seconds. One animal slide was kept the same for the duration for the experiment, whereas the other was constantly altering and showing new animals. It was found (by tracking eye movements) that the 'novel' animal was looked at for more and more time (relative to the 'non-novel' animal) as the experiment progressed (Berlyne, 1960). See also Friedman (1979).

Surprisingness (or incongruity)

3.7 This refers to an informational element in relationship to other informational elements. As patterns occur, we begin to construct hypotheses as to 'what will happen next', and if these expectations are violated, we are 'surprised'. Thus in an experiment showing geometrical displays of 'dots' on a screen, the dots with a fundamentally different pattern from the 'norm' were looked at for longer, and provoked more 'arousal' than the 'normal' patterns (Berlyne, 1957). This was backed up by an experiment by Denny on rats, in which hungry rats were given the 'choice' of two mazes to seek food. One was the 'normal' maze they usually found food in, and one was a new maze, with a different order. The rats overwhelmingly chose the 'new' maze, indicating they were 'bored' with the old one, and sought new stimuli to raise their arousal (Denny, 1957).

Used with permission of the author and the Scottish Government.

Complexity

3.8 The information content of shapes and figures (for example) can be quantified. So for example, one can say a line is made up of one 'bit' of information, two lines are made up of two 'bits' of information, an equilateral triangle, three bits, and so on. Again, it was discovered that the more complex the shapes the more they were looked at in an experimental situation.

3.9 Therefore, novel, surprising and complex figures and sounds will be more arousing than boring repetitive and simple shapes and sounds. It should be noted that in terms of what subjects *liked,* shapes that were over complex, over-'novel' and over surprising were disliked as much as shapes that were boring and simple. People preferred an intermediate point: not too arousing, not too boring.

3.10 It is clear how this relates to a theory of attention. Attention is posited in this theory as a means to an end: a means of modulating arousal via the pursuit of information. Information will be sought out if the subject is too bored, and avoided if the subject is too stressed. In the 'underarousal' state the subject will be more likely to produce the 'Orientation Reaction' to complex, incongruous and novel phenomena. This OR will be what we term 'distraction'. It should be noted that these findings have been broadly confirmed by studies of drivers and signs. Drivers were more likely to notice signs/billboards that were bright, contained colour contrasts (black and white, for example), and were large: in other words, that contained arousing, stimulating information. It seems highly likely that 'neon' 'flashing' signs would be even more 'arousing' in this sense, and, hence, distracting (Forbes et al, 1968).

3.11 Now there is an obvious question here that will be dealt with later. If the subject is performing a task which s/he finds boring, and information presents itself, is the Orientation Reaction conscious or unconscious? That is, can the subject choose to 'override' this reaction, or, physiologically, is the impulse towards arousal too strong? If the latter were the case, this would obviously have strong implications for driver distraction.

BROADBENT'S 'FILTER' THEORY

3.12 The other main 'stream' of attention theory derives from Broadbent. It should be noted that Broadbent saw his theory as an adjunct to Hebb's theory. He never denied the important role that arousal played in attention processes, nor that the subject was actively seeking information (as opposed to passively receiving it) (see, for example, Broadbent 1958: 126-127). Nevertheless the emphasis of his theory was somewhat different.

3.13 Broadbent also used information theory. However, he concentrated on the fact that a given communication medium (for example a 'phone line) has a limited capacity: only a certain amount of information can pass through it. He then went on to hypothesise that human information processing had similar properties. Therefore, the 'medium' of information transmission into the brain (that is, the ears or eyes) would have a limited capacity to transfer information to the brain. Broadbent's theory is, therefore, a 'bottleneck' theory. He hypothesised that because of this limitation, 'filters' have evolved to limit the amount of information that can be processed.

Used with permission of the author and the Scottish Government.

3.14 To test his hypothesis, Broadbent carried out a number of experiments, mainly concerned with attending to two information sources at the one time. For example, in one experiment subjects had to attend to speech while (occasionally) a buzzer would sound. Broadbent found that task performance was reduced, and concluded that the information transmission aspect of the senses had been 'overloaded', and that information transmission was therefore a 'single channel': more than one information source would lead to overload.

3.15 It should be noted that the essence of Broadbent's theory, that the senses of human beings are *single channel* information transducers prone to 'bottlenecks', is false. This was demonstrated soon afterwards by Treisman, who demonstrated that there had to be more than one information-transmission channel. For example, subjects were asked to carry out a listening task played into one ear whilst 'distracting' information was played in the other: there was no performance decrement (although there was when more than one other information source was provided) (Treisman, 1964b).

3.16 More importantly, Moray (1959), showed that if the 'second' information source contained information that was personally important to the subject, then the subject would attend to it: in other words, it was not filtered out completely.

3.17 Treisman used this finding to create a new theory, that instead of being wholly filtered out, extraneous information was *attenuated.* That is, instead of being 'filtered out' (and, therefore, not processed), it would be *accorded less importance*, and processed, as it were, in a preliminary fashion. If its information features were 'recognised' then it would be further processed and, if necessary, brought to consciousness (Treisman, 1964b). In other words, the main features of Broadbent's theory (that information-channels have a limited capacity) seem to be true, but his specific predictions were false. Information is not filtered out, and there is not just one information channel.

The Theories of Neisser

3.18 At this point the findings of Neisser (1976) should be discussed. In the 'seventies, Neisser and others carried out various versions of the 'dual task' experiments above, and bore out their main findings. However, he then carried on to investigate what effect practice had on these activities. For example Hirst et al (1980) discovered that with practice, subjects could learn to take dictation and read a story at the same time. This suggested that, whereas *at any given time* the attentional ability of a subject was limited this limit could vary over time, and could in fact be increased with practice. Therefore, even though in absolute terms the capacity of the information transmission channel was fixed, the subject's ability to process the information provided could be increased (by analogy this is the same as the way data is transmitted on the Internet: when files are compressed more information can be transmitted. Nothing has changed in the hardware, but with the addition of particular software, the computer 'learns' to accept and process more information).

3.19 This fits in well with Hebb's original theories as proposed above, given that the 'arousal point' varies over time. At some times the same information will lead to overarousal (stress), whilst at others it will be 'just right'. To use the example of time of day, the amount of information available at a night-club or crowded bar will be acceptable, whereas it would lead to overload at seven in the morning. In the current context, it might be predicted that whereas to begin with, new drivers would have difficulty in talking to a passenger and

Used with permission of the author and the Scottish Government.

driving at the same time, with practice this would become easier. This was demonstrated experimentally by Brown and Poulton (1961).

3.20 Neisser also pointed out that whereas the limited-capacity channel argument was undoubtedly correct in an absolute sense, it could be argued that it was a slightly strange way of conceptualising the situation. A television can only show one channel at a time, but this is not normally regarded as a problem. We 'channel flick' until we find the channel we wish to watch, and then we watch it. In a sense we 'filter out' extraneous information, but usually because we are not interested in it: not because we run the risk of being 'overwhelmed' or 'overloaded'. This argument becomes stronger when we remember that (unlike a television) human beings can indeed process information from more than one channel at the same time (with practice).

3.21 Finally Allport (1993) points out that current view of brain physiology identifies *many* attentional 'sub-systems' in the brain (cf. also Castiello, 1997), and to state that there is one 'attention' system is a gross oversimplification. In other words, attention is an intrinsically multi-channel phenomenon. (Note: physiologically, arousal also consists of many subsystems, but positing one arousal system functions adequately as a theoretical construct (Green, 1987)).

Summary

3.22 Arousal modulates attention. We seek arousal 'homeostasis'. However this point varies over time. Information modulates arousal. We seek the information to modulate our arousal levels. Complex, novel and 'surprising' information increases arousal. Each individual 'information-channel' has a limited capacity. However, there are many of these channels. Our ability to process the information given to us by these channels can be increased with practice.

3.23 The questions that will be asked in the next section are:

- Is the Orientation Reaction (OR) automatic?
- What attracts attention? (i.e. raises arousal?)
- What happens to attention when another task is being performed?

PERCEPTION AND PSYCHOPHYSICS

3.24 Berlyne's theories predicted that arousing information would be of a specific kind. He demonstrated that bright, stimulating, (etc.) lights triggered the Orientating Reaction (OR), an automatic response strategy that Berlyne saw as being part of the constant search for arousal. This view is supported by current research into the psychological study of search patterns and visual stimulus.

3.25 Such experiments tend to be laboratory experiments in which subjects are seated in front of a computer and are asked to perform tasks. Occasionally points of light ('singletons') which are not connected with the task are shown. Eye movements can be tracked, to see whether they are registered are not.

Used with permission of the author and the Scottish Government.

3.26 Here some jargon must be explained before the relevance of these experiments to driver distraction can be shown. It has been shown in (in Yantis and Johnston, 1990) that there are two main modes of visual search. Visual mode A is the 'default state'. It is used when the subject is not engaged in a task and is not searching for something. This visual search is 'broad'. That is, the subject 'takes in the whole picture' and pays attention to peripheral lights and actions.

3.27 In 'search' or 'attentional' mode (visual mode B) on the other hand, visual search is narrow. The subject concentrates on the immediate visual field. S/he is concentrating, and pays less attention to objects at the periphery of the visual field (for a specific example taken from the driving experience, see Crundall et al 1999, and Mourant and Rockwell, 1974).

3.28 The strength of this effect should not be underestimated. For example, in one experiment (Simons and Chabris, 1999) subjects were asked to view a basketball-like game and follow the number of times one of the team possessed the ball. Meanwhile, a woman in a gorilla suit walked briefly into the game. When asked afterwards, subjects *did not recall seeing anything unusual*. Because it was not task relevant, it was not processed. This has also been shown in more specific visual experiments in which observers were not distracted by an 'abrupt onset' (i.e. a singleton suddenly appearing on the computer screen) when performing a task which required attention (for example, Yantis and Johnston, 1990, and Yantis and Jonides, 1990). However, this finding has many exceptions, as will become obvious. For example, Theeuwes also discovered that when subjects were searching for an *unknown* shape they could easily become distracted by something with an 'arousing' (bright) colour even though they were not looking for something of that colour (Theeuwes, 1991). However Pashler discovered that when looking for a *known* object (that is, they were told to look for a square or triangle), it was far harder to slow down their search rate by distraction (Pashler 1988).

3.29 There are further debates in this field (specifically concerning whether there is more than one kind of 'search mode'), but the key findings are obvious. That is, in 'passive' or 'normal' visual search then subjects are open to what might be termed 'normal' distraction. That is, some bright light or colourful shape, from the corner of vision, might grab their attention. However in 'search mode' this is much less likely. But here there is another twist. If, in search mode, the subject is searching for something *specific* (i.e. a 'stop' sign s/he knows to be there), s/he is unlikely to be distracted. But if they are searching for something and *they do not know if it is there or not* (for example, the approach to a junction where the subject does not know whether there is a stop sign or not), then s/he is liable to have the search rate slowed by extraneous distracters, as s/he has to search through the whole visual field (for a demonstration of this in a driving context cf Brown and Cole, 1969). Bahcall and Kowler (1997) found that ability to identify characters was worsened if the characters were closer together. This again demonstrates that visual 'clutter' slows response times and has a negative impact on performance. This was demonstrated in a driving context by Hughes and Cole (1984), who discovered that many safety signs were not being noticed by drivers in situations of high visual 'clutter'. This was corroborated by Brown, and Monk (1975). Elements which seem to add to confusion are variability in the size of background elements and mean luminescence (Cole and Jenkins, 1984: Jenkins and Cole, 1982) (Note: it is also possible that because 'cluttered' scenes have less 'structure' they might also confuse search strategies, which seem to improve when the target is located in a clear, coherent, visual scene (Biederman, 1972)).

Used with permission of the author and the Scottish Government.

3.30 So there is a difference here between distraction *per se* (that is, having one's attention 'distracted' from the specific task), and complexity of visual field. The 'complexity of visual field' issue is specifically that of time. The driver is not 'distracted' in the same sense that a driver driving on a motorway may have his/her attention distracted by a bright flashing billboard. However, in terms of slowing up the search process (considering the vehicle will probably be moving, perhaps towards an interchange or junction), this might still have an impact on safety, because the driver will simply run out of time to search the visual field, and will have to make a quick, *ad hoc* judgement as to whether to proceed or not (in other words, to decide whether the sign is simply not there, or that not enough time was available to look for it). This decision, of course, could be the wrong one.

Summary

3.31 Drivers may be distracted by extraneous information in low arousal situations (monotonous roads, for example). They may also be distracted by extraneous material whilst searching for other visual phenomena (signs for example). This is more likely to happen at intersections.

3.32 This still leaves the issue of the 'first' (low arousal) kind of distraction described above. This would be a situation when the driver was distracted from his/her task: that is, it would be 'bottom up', (or exogenous (Theeuwes, 1991)) or being distracted by task irrelevant data. We have seen that the driver (conceptually) can be distracted when in 'broad' 'non-search' mode. But is distraction possible in search mode as well or is all vision 'controlled' or 'top down' (endogenous)? For example, if one was driving and concentrating intently on the road (perhaps driving in such a manner because it was foggy, or there was snow on the ground) and a flashing light occured in the extreme right of the visual field. Would this be processed? If it were, this would be 'bottom up': unconsciously having our gaze drawn to an object when we don't 'want it' to be.

3.33 Here the debate has raged, but some consensus is now emerging. Mack and Rock (1998) decided that such 'bottom up processing' in search mode was impossible, after an ingenious series of experiments. For example subjects were asked to observe a target variable, whilst 'distracters' were shown at various distances from the target. The interesting point is that subjects did not even recall having seen the distracter. However, Theeuwes argues for the opposite conclusion (Theeuwes and Godjin, in press). Instead of eliciting a verbal response (i.e. asking subjects whether they 'remembered' the distracter), Theeuwes measured the length of time it took to perform the task. He discovered that the task took longer when there were distracters, regardless of whether subjects 'remembered' seeing the distracter at all. The problem is how to reconcile the views of Mack/Rock on the one hand, and Theeuwes on the other.

3.34 The solution, it seems, is to make a distinction between conscious and unconscious eye movements. Theeuwes showed that when presented with a visual distracter in 'attentional (or search) mode', when the distracter is not the object being searched for, the eye is automatically drawn to it, but unconsciously and for a short period of time (a few milliseconds). The brain does not register this, and so the subject has no memory of having seen the distracter. In *non*-attentional mode, on the other hand, the Orientation Reaction (OR) is directed to the distracter, but it is also consciously processed. Harbluck and Noy (2002) demonstrated this in a driving/experimental context. Using a sophisticated eye

Used with permission of the author and the Scottish Government.

tracking device, they found that as arousal/information/cognitive demands increased, eye movements tended to concentrate more and more on the centre of the visual field and less and less on peripheries (although it should be noted that this is just a tendency: the eye usually tends to concentrate on activity on the central of the visual field, or, in the case of drivers, in the direction the car is moving (Cole and Hughes, 1990: Wolfe, O'Neill, and Bennett, 1998. For more details of eye movements while driving, see Land, 2001: Land and Horwood, 1995: and Land and Lee, 1994)). Moreover, saccadic eye movements (the eye 'darting around') decreased, with the gaze becoming more fixed (note: 'Saccadic' eye movements are not to be compared negatively to some other kind of eye movement. The *normal* behaviour of the eye is saccadic 'sampling' of the environment. The eye rarely rests on any one object in the visual scene for longer than a third of a second (Potter, 1975)). This kind of visual concentration would mitigate against visual distraction from the road signs/other vehicles etc. on the far left or far right of the visual field. (Note: when asked in the Harbluck and Noy experiment, subjects noted that 'distraction' increased as task difficulty increased, but they clearly meant distraction *by the task*, not external-to-vehicle visual distraction (Harbluck and Noy, 2002)). So therefore, distraction is less likely in these situations: but *not* impossible. As Wolfe writes: 'It seems fair to say that there are paradigms where singletons *must* capture attention *even if the subject does not want this to occur*' (Wolfe, 1998: 19) (italics added). It seems, therefore, that 'bottom up' (involuntary) distraction (albeit 'unconscious') is possible *even in 'search mode'* (although the kind of object likely to distract may still be affected by what is being searched for (Casimir et al, 2002)).

3.35 What, therefore distracts attention? As one might expect from Hebb's arousal theory, we would expect high information, novel and surprising events to attract attention, and this is in fact what we find. Irwin et al, (2000) demonstrated that 'abrupt onsets' (i.e. objects that appear 'instantaneously') and luminescence attract attention involuntarily. This bears out Berlyne's point about surprisingness and novelty, and again confirms the arousal (OR) hypothesis. It also bears out the finding that the OR is, in some circumstances, involuntary. In terms of billboards and signs, Coetze (2003) stresses that high information signs (quantified in terms of bits) will require more time to be processed, and, of course, Berlyne stressed that high information ('interesting') signs are more likely to be looked at, and for longer (Friedman, 1979), than 'boring' signs.

3.36 The relevance of these experiments for driver distraction, and their explanation in terms of arousal theory are as follows. As the pre-eminent visual theorist of our time, J.J. Gibson (1979) argued, we are active, information seeking organisms, existing in a certain environment, with which we are 'structurally coupled' (Varela, 1991). We seek information to regulate our arousal levels (Wallace et al, 2002). When we are aroused by a task (that is because it is stressful or at least interesting) we concentrate on it: and our field of attention narrows. The more aroused we are, therefore, the less likely we are to be distracted consciously. However we *are* 'distracted' automatically and unconsciously even in this situation, by novel, 'surprising' stimuli, but the visual system quickly decides what is and is not relevant. If it is not seen as being relevant then we don't consciously 'perceive' it (Ruz and Lupiáñez 2002). Despite this, even this automatic distraction may slow down response times.

Used with permission of the author and the Scottish Government.

AROUSAL AND UNDERAROUSAL

3.37 The key difference between the Broadbent and the Hebb view of perception is that Broadbent's theory only explains cognitive (or channel) overload. The Hebb theory does this too, but it also predicts difficulties due to cognitive *underload.*

3.38 Therefore, this theory predicts not one but two problems with driver attention: overarousal and underarousal (Young and Stanton, 2002). In arousal (search mode) situations, the driver is less likely to be distracted, although, as we have seen it is still possible. However, s/he may not yet have learned to cope with the amount of information that needs to be processed. In low arousal (broad 'scanning' mode) the driver is likely to be distracted because s/he is bored, and needs stimulation in the form of information.

3.39 The Catch 22, as regards underarousal, is, however, that drivers need information in order to keep themselves interested in what they are doing. So for example, de Fockert, Rees, Frith and Lavie write: 'Several studies have shown that distracters that could not be ignored in situations of low perceptual load (....) were successfully ignored in situations of high perceptual load' (de Fockert, 2001). *However the information that is needed to raise arousal/attention (perceptual load) might in itself function as a distracter.*

3.40 As a general rule, therefore, drivers 'self-regulate' their attention adequately. In low arousal conditions (boredom), s/he daydreams, or looks at the external environment. In high arousal conditions (risky situations) s/he concentrates on the road, and the task. Problems arise when risk has, as it were, objectively risen, but the driver does not realise it has, so arousal stays low. Holohan, sums up this idea best when he writes: 'The most dangerous traffic situation is that in which the driver is unable to perceive the danger. If the danger is not perceived, the reticular system is not brought into play. Consequently the driver's level of arousal is low, and his/her reactions to external stimuli will not be as rapid as they would have been had the arousal level been higher' (Holohan, 1979, 36) (see also Haga, 1984).

Summary

3.41 Distraction seems to associated with both underarousal and overarousal. However, the kind of visual arousal ('external-to-vehicle distraction') discussed here is more likely in situations of low arousal. It is still possible, however, even in conditions of high arousal ('search mode').

SPECIFIC VEHICLE AND VISION BASED EXPERIMENTS

3.42 As well as 'pure' psychophysics perception experiments, there have also been experiments that deal specifically with information processing effects in vehicles.

Arousal

3.43 Boadle (1976) showed that at night (i.e. in low information/arousal situations) vigilance and task performance decrease quickly. In low arousal situations subjects were more likely to respond, but less likely to respond accurately, to task demands. Giambra

Used with permission of the author and the Scottish Government.

(1995) showed that Task Unrelated Imagery and Thought (TUIT) or 'daydreaming' was more associated with the performance of uninteresting or uninvolving tasks. This suggests that in low arousal situations (as drivers become bored), they are more likely to become distracted (i.e. to seek non-driving related information), and less likely to make accurate decisions as a result of the information gained.

3.44 It is possible that this state is related to the phenomenon known as 'Highway Hypnosis' (Brown, 1991). This is a state in which drivers in a state of low arousal (usually at night, in low traffic situations), start to 'dream' or 'sleep while awake'. It is often associated with the phenomenon of 'land train' accidents in Australia. Land trains are extremely long trucks which travel the Australian outback. Accidents involving these trucks are not associated with city driving, as one might expect, but with the long, featureless roads in the outback, with little or no surrounding traffic. The implication is that the lorry driver went into a state of 'highway hypnosis' and simply left the road. It has been suggested that the introduction of 'visual or audio stimulation' would be an effective remedy to this problem. In other words, 'highway hypnosis' seems to be associated with low arousal, and the solution is to raise arousal (Moses, 1995: 62).

3.45 An important corollary to this, and important in the context of distraction, is 'phototaxis', sometimes called the 'moth effect' or 'the fascination phenomenon' (Charles et al 1990). This seems to be associated with 'highway hypnosis', except that in this case, the driver 'fixates' on a light (either by the side of the road, or the headlights of the car in front). Sometimes the driver simply fixates on a car parked on the side of the road, and drives into it (frequently a police car with its lights on), or else fails to brake adequately when the car in front brakes. Again, it is associated with long featureless roads and low arousal. It should be noted that the moth effect (unlike what is generally understood as 'external' distraction) can occur in the centre *or* the peripheries of the visual field (for example, a driver may fixate (or become absorbed (Tellegen, A., & Atkinson, G. (1974)) on the lights of the car in front of him/her, or on a police car or road sign on the side of the road).

3.46 Chapman discovered (Chapman and Underwood, 1998) that in high danger situations (i.e. high arousal situations) drivers narrowed their visual search, and thus 'focused attention'. More specifically, novice drivers had longer fixation times, suggesting that they had less experience in 'managing' the high arousal of dangerous driving. Interestingly (and counter-intuitively) information-poor rural roads provoked longer visual fixation times (and therefore, presumable, higher arousal levels) than information-rich urban streets. This suggests that perhaps drivers sometimes compensate in 'low arousal situations' (in the 'information-poor' areas) by raising their arousal levels to stay alert, or perhaps it simply means drivers are more used to driving in urban areas and find rural areas more 'interesting'. In any case, it suggests that the high information load of urban driving can sometimes be counteracted by the driver becoming 'blasé' and reverting to 'broad attention mode': this leading to a greater risk of distraction.

Individual Differences and Impact on Attention

3.47 These experiments are not directly relevant to driver distraction per se, but detail general driving characteristics related to attention. Avolio, Kroeck and Panek (1985) carried out 'dual task' experiments similar to those above. Subjects were asked to fill in 'Perceptual Style' questionnaires (which measure ability to 'separate' objects from their background) and

Used with permission of the author and the Scottish Government.

tests of selective attention. Poor performance on these tests was correlated with poor task performance. This suggests that drivers who have not yet learned to adequately manage attention are more likely to have accidents (for support of this hypothesis, see Gopher, 1982 and Hakinnen, 1979).

3.48 In an experimental study, Rosenbloom and Wolf (2002) assessed the relation between risky driving behaviour and high scores on Zuckerman's Sensation Seeking Scale. As predicted, 'sensation seekers' were more likely to engage in a number of 'risky' behaviours. Unfortunately 'distractibility' was not one of the features tested for. Nevertheless, this indicates an area for future research.

3.49 Gopher (1982) carried out a number of tests on pilots concerning the ability to 'divide attention'. He discovered that the ability to divide attention was correlated with ability to fly safely measured by a number of parameters. Hakinnen et al (1979) discovered similar results. One of the parameters tested was the ability to maintain attention. Again this suggests a link between ability to sustain attention and safe driving.

Alcohol

3.50 In a Spanish study (Rossello et al, 1999), it was discovered that the consumption of alcohol, even below the (Spanish) legal limit, reduced the ability to divide attention. This would certainly indicate that (for example) ability to use a mobile phone and drive would be lessened by the consumption of alcohol. Implications for external-to-vehicle distraction are less clear. For example in another study, Marinkovic et al (2001) discovered that the consumption of moderate amounts of alcohol decreased the function of a neurophysical response 'evoked by ... novel and rarely occurring stimuli, regardless of whether they are task relevant' (Marinkovic, op cit.: 536). This suggests of course that drivers under the influence of alcohol would be *less* likely to be distracted by task irrelevant external phenomena (such as billboards) although, of course, also less likely to notice task relevant stimuli (such as oncoming traffic).

Factors Affecting Distraction

3.51 There follows a discussion of whether there are significant individual differences in propensity towards distraction, either biological or caused by specific behaviours.

Age

3.52 Given that, as stated, external-to-vehicle distraction tends to be visual, the effect of age on driver's visual acuity is particularly important. It has been generally noted in a number of studies that visual acuity tends to decrease with age (Staplin et al, 1997). This process begins at about 45 y/o, and increases rapidly at 65+ (Klein, 1991). However, it has proved surprisingly difficult to demonstrate a causal relationship between lack of visual acuity and accident rates. It seems likely that drivers with poorer visual acuity compensate by driving more carefully and more slowly (and not driving in hazardous conditions), thus counteracting the effect, at least to a certain extent. Moreover, the necessity for 20/20 vision in *normal driving conditions* is not immediately apparent. Some studies have found links

Used with permission of the author and the Scottish Government.

between certain aspects of visual perception and 'riskiness' in driving, but the link between this and distraction is not clear (Burg 1971, Evans and Ginsburg, 1985). More to the point it is not clear why decline in visual acuity should have a strong effect (or any effect) on driver distraction: especially given that these distractions, as mentioned above, tend to be visual.

3.53 Therefore there are other studies in this field which are possibly more relevant. Staplin et al (1997) have demonstrated that selective attention and attention switching abilities deteriorate with age. This fits in with the attention model proposed by Neisser, in which attention is a skill. Like most skills, it is immature in the late teens and early twenties, improves up until middle age, and then deteriorates. A number of laboratory experiments have taken place which test the hypothesis that multitasking is harder for the elderly. These usually use the methodology discussed above, and it seems that there *is* a link between inability to perform selective attention tasks of the sort discussed above (that is, where there is an auditory task which must be carried out concurrently with a driving task), and age. (See for example Brouwer et al, 1991)).

3.54 Following on from these experiments, various other studies have demonstrated that older adults respond more slowly to 'surprising' phenomena than younger drivers, thus suggesting that perhaps old people's propensity to have accidents where 'distraction' is counted as a variable is due to other features of the ageing process other than the strictly attentional: that is, slower reaction times, and other factors.

Young Drivers

3.55 Young drivers are disproportionately represented in accident statistics. In Great Britain car drivers aged 17 to 21 account for 4.4% of license holders, but represent 13% of all car drivers involved in accidents (Department of Transport, 1998). The AAA North Carolina (Stutts et al, 2001) project found that young drivers (under 20) were the most likely to be caught in a distraction related accident, although this was mostly related to internal-to-vehicle distraction.

3.56 This might seem to be contradicted by the data on old drivers above. But it must be remembered that most of the pure driver distraction data relates to multitasking (and not, therefore distraction proper). It may well be that young drivers are more susceptible to distraction given their high desire for arousal and risk (see below).

3.57 However, as always, we should remember that these are merely hypotheses. A study by Ramney and Pulling (1989) discovered no link between a battery of cognitive tests and driving ability. It is possible that the small numbers (n=50) were responsible for this, but it should serve as a reminder that these issues are complex.

Fatigue/Age

3.58 Ingwerson, (1995) discovered that the 17-25 age group were heavily over-represented in an Australian database for fatigue-related accidents. Given that fatigue seems to be strongly related to 'relaxing attention' (Kenny, 1995) which can in some cases lead to the driver losing control of the car (especially in information poor monotonous driving conditions), this seems to suggest a link between youth and inability to sustain attention.

Used with permission of the author and the Scottish Government.

This fits in well with arousal theory. Zuckerman (1979) argues that young people are more likely to be 'sensation seekers', and that, therefore, in 'boring' driving conditions they are more likely to 'drift off' or otherwise shift attention away from the driving task. Again, this would make them more likely to fall prey to 'phototaxis' or the 'moth effect' given that attentional narrowing (and concentration on the task) would give way to a broader attentional sweep, during which one is more likely to be distracted.

CONCLUSION

3.59 It seems highly likely that young (17-25) and old (65+) drivers have particular attentional difficulties and that the consumption of alcohol and lack of sleep generally reduce the driver's ability to multitask, process information, and carry out adequate visual searches. This would therefore seem to indicate that drivers in these two age groups, because they cannot 'control' their attentional skills, run a higher risk of distraction and that this risk would be increased by the influence of alcohol, lack of sleep etc.

Summary

3.60 It is likely that both young (age 17-21) and old (65+) drivers run a higher risk of distraction, although for different reasons. It is also likely that fatigue and alcohol have a deleterious effect on attention management.

Used with permission of the author and the Scottish Government.

CHAPTER FOUR STUDIES OF DRIVER DISTRACTION AND WHAT THEY FOUND

4.1 To reiterate, therefore, there is a large body of scientific data relating to attention which is of relevance to driver distraction. Now, however, we will look at specific road accident databases which contain information relating to distraction, to see whether there is empirical data supporting the hypothesis that driver distraction is, in fact, a major problem in terms of road safety.

KINDS OF DATA: U.S. DATABASES

4.2 There are two U.S. databases which are of interest here: FARS (Fatality Analysis Reporting System), and NASS (National Automotive Sampling System). NASS can be further subdivided into NASS/GES (General Estimates System), and NASS/CDS (Crashworthiness Data System). The vast majority of studies relating to driver behaviour use data from one or both of these databases.

FARS

4.3 FARS is the oldest and most prestigious of these databases (collection of data began in 1975), and uses data from Police Accident Reports (PAR) to create an electronic database of contributory factors to road accidents. Since FARS deals only with fatalities (deaths must occur within 30 days of the accident), it avoids many of the problems discussed above as to gauging the 'seriousness' of an accident. Its major deficiency as regards studying external-to-vehicle driver distractions is that it does not collect data on Non-Technological Distractions. Moreover, FARS uses police reports from many different states, and it is not clear if data-collection methodologies are identical (see above) (Tessmer, 2000). Wang et al also point out that 'PAR based data are generally superficial and not designed to provide a scientific determination of crash causation' (Wang et al 1996: 3).

NASS

4.4 NASS (created in 1979), on the other hand, is a proactive database. That is, accidents (of any sort) are selected randomly in order to produce a representative sample of accidents in any given year. Then trained accident investigators obtain data (via interviews, and 'on the spot' investigation), and a database of accident causes is created (NHTSA 2001).

NASS CDS and GES

4.5 The NASS CDS data deal only with accidents serious enough for one or more cars to be towed away from the scene of the crash. 'The CDS (Crashworthiness Data System) data collection process includes review of the PAR, vehicle and accident site investigation, reconstruction of component trajectories, interviews with drivers and other persons, and review of medical records' (Wang et al, 1996: 3). In the GES (General Estimates System) a

Used with permission of the author and the Scottish Government.

similar process takes place directly on PARs, with the results being coded, and then problem areas identified (U.S. Department of Transportation, 1999).

THE INDIANA STUDY

4.6 The largest study yet carried out on general traffic safety is the Tri-Level Study of the Causes of Traffic Accidents. This is sometimes referred to as the Indiana study as it took place under the auspices of the University of Indiana.

4.7 The Tri-Level study is so-called because of the three levels of investigation used. These were: level A, in which basic demographic and driver data were obtained from standard databases and populations surveys (for example, data relating to age and gender was obtained from a general study of licensed drivers, and vehicle registration data was obtained from the Indiana Bureau of Motor Vehicles).

4.8 In Level B teams of accident investigators were assembled, such that by 1974 they were able to reach any accident in the target area 24 hours a day seven days a week. When an accident was reported, an investigation team was dispatched who were able to take photographs, inspect vehicles and interview drivers. Later they were able to produce a report as to what 'caused' the accident.

4.9 Level C was a more intensive *post hoc* investigation in which drivers were interviewed by experienced psychologists or sociologists, accident scenarios were reconstructed and experiments carried out to test hypotheses.

4.10 The 'on-site' team (responsible for the level B investigations) found that human factors were identified as being the 'definite cause' of 64.3% of accidents. These figures rose when discussing probabilities so that the level B team were prepared to state that 90.3% of accidents were probably *or* definitely caused by human factors. The level C investigations were slightly higher (92.6% probably or definitely caused by human factors).

4.11 It should be noted that Indiana is a predominantly rural state, and that it may not be possible to extrapolate these results to more urban areas.

Findings

4.12 The findings are given in Table 4.1, below.

Used with permission of the author and the Scottish Government.

Table 4.1

	% of Accidents			
Human Direct Causes	**In-Depth: Definite Cause**	**On-Site: Definite Cause**	**In-Depth Possible Cause**	**On–Site Possible Cause**
Improper Lookout	17.6	13	23	20.3
Excessive Speed	7.9	7.1	16.9	14.7
Inattention	**9.8**	**8.4**	**15**	**13.9**
Improper Evasive Action	4.8	4.5	13.3	10.3
Internal Distraction	5.7	4	9	6.1
Improper Driving Technique	6	2.4	9	3.9
Inadequately Defensive Driving Technique	2.4	2.3	8.8	4.9
False Assumption	4.5	8.4	8.3	11.8
Improper Manoeuvre	5	6.2	6.2	7.1
Overcompensation	3.3	1.8	6	3.2

4.13 The numbers of cases with 'External Distraction' as a possible or probable cause were not a sufficiently large category to be included in the table.

4.14 Perhaps more suggestive is another finding that analysed the frequently occurring causal factors associated with property damage. (Frequently occurring defined as factors occurring 16 or more times in on-sight investigation). In Table 4.2 the 'Human Direct Causes' of this variable are shown.

Table 4.2

Human Direct Cause	Percent Property Damage Accident (%)
Tailgating	91.7
Inadequate Signal	89.3
False Assumption	85.1
External Distraction	**84**
Improper Lookout	83.4
Improper Driving Technique	82.3
Inattention	79.1
Misjudgement	78.2
Improper Manoeuvre	76
Improper Evasive Action	75.6
Inadequate Defensive Driving Technique	72.4
Internal Distraction	67.9
Overcompensation	67.2
Excessive Speed	57.6

4.15 Unfortunately the 'External Distraction' Category is not broken down anywhere in the report (Treat et al 1979 a and b).

AAA STUDY

4.16 The AAA foundation for Traffic Safety funded the University of North Carolina to interrogate the NASS-CDS database in order to attempt to identify how many accidents were

Used with permission of the author and the Scottish Government.

caused by driver distraction (Stutts et al, 2001). The report also contained narrative searches (qualitative searches) of the database of CDS and North Carolina data. 1995 was the year that 'driver inattention' was included as a code in the NASS-CDS taxonomy. The AAA study amalgamates data from 1995-1999 to create an average.

4.17 The report defined driver distraction as a situation 'where a driver is delayed in the recognition of information needed to safely accomplish the driving task because some event, activity, object, or person within or outside the vehicle compelled or tended to induce the driver's shifting attention away from the driving task' (Stutts et al, 2001: 6). They specifically exclude 'looked but did not see' incidents, and Task Unrelated Thought (TUT). The form had a section for 'Driver Attention Status', which consisted of five subcategories: 'Attentive, Distracted, Looked but Didn't See, Sleepy or Fell Asleep, Unknown/No Driver'. Only if the driver was noted as being 'Distracted' was a further series of options made available to describe why the driver was distracted. Here there were thirteen separate headings.

1. Eating or drinking
2. Outside person, object or event
3. Adjusting radio, cassette or CD
4. Other occupants in vehicle
5. Moving object in vehicle
6. Smoking related
7. Talking or listening on Cellular Phone
8. Dialling cellular phone
9. Using device/object brought into vehicle
10. Using device/controls integral to vehicle
11. Adjusting climate controls
12. Other distraction
13. Unknown distraction

4.18 It will be seen that category 1, and categories 3-13 represent 'inside distracters', with only category 2 representing 'outside distracters'.

Problems with the Study

4.19 Before moving on to the findings of the study, we should first look at some of its limitations, as explained by the AAA themselves.

Used with permission of the author and the Scottish Government.

Missing Data

4.20 In spite of 'intensive investigation' the 'driver attention' status was marked as 'unknown' for 36% of the accidents presented. Moreover, even when 'driver distraction' was marked, 34% of the 'causes' were listed as being 12 or 13 above: that is, 'other' or 'unknown'.

Sample Size

4.21 Because of small numbers these figures should be extrapolated to the national level with extreme caution. For example, the estimates as to mobile phone distraction are based on only 42 cases.

Exposure time

4.22 It is not noted in the CDS database how long the distracting activities lasted. Therefore it is hard to quantify to what extent they qualify as a risk factor. For example, if drivers using mobile phones were travelling cross-country and had been on their phones all day, then we would have to conclude that mobile phones are not much of a risk. On the other hand, if the drivers started to make calls and then immediately crashed, we would have to conclude it was much more of a risk. It might be added that the AAA study applies only to the United States. It is not clear to what extent these findings apply to other countries (University of North Carolina, 2001).

Findings of the AAA Study

4.23 Between 1995 and 1999, in 'serious' accidents available on the CDS database, **8.3%** of the drivers were described as being distracted at the time of the accident. This could be broken down into internal-to-vehicle distraction and external-to-vehicle distraction. External-to-vehicle distraction accounted for 29.4% of distracters. Internal-to-vehicle distraction accounted for 36.4% of distracters. There were also 25.6% distracters counted as 'other' and 8.6% counted as 'unknown'.

Further Breakdown of Statistics

4.24 Unfortunately the 'external-to-vehicle distracters' were not further broken down in this database. However, in addition to the coded variables on the CDS data file, it was also possible to analyse the written narratives that describe the accidents in free text. The years 1997 and 1998 were made available for analysis in this way. The results were (presumably) classified (the report does not make this clear). It should be noted that only 84-88% of the (raw number of) distraction cases contained any data at all, and of these, 43% contained insufficient data to clarify the nature of the distraction. Therefore the stricture above about small numbers should be particularly borne in mind regarding these data. Only the 'Outside Person, Object or Event' category has been further subdivided, as this is the specific object of this study (See Table 4.3).

Used with permission of the author and the Scottish Government.

Table 4.3

Distraction Category	1997 CDS Data (n=332 narratives)	1998 CDS Data (n=412 narratives)
Outside Person, Object or Event	**96**	**125**
Outside Traffic/Vehicle	17	37
Police	8	5
Animal in Roadway	3	10
Sunlight/Sunset	1	6
People in Roadway	3	5
Crash Scene/Leaving crash scene	3	1
Road Construction	3	0
Other	13	20
Not Specified	45	41
Adjusting Radio/Cassette/CD	**10**	**21**
Other Occupant	**41**	**53**
Moving Object in Vehicle	**12**	**16**
Using Other Device Brought into Vehicle	**20**	**30**
Unknown Distraction	**37**	**23**
Using Other Device Integral to Vehicle	**10**	**8**
Adjusting Climate Controls	**3**	**0**
Eating/Drinking	**7**	**16**
Cell Phone	**8**	**10**
Smoking	**11**	**4**
Other Distraction	**66**	**79**
Medical Problem	16	18
Looking Outside Vehicle	8	9
Looking Inside Vehicle	8	3
Reaching for Object		4
Other	1	18
Not Otherwise Specified	3	27
Inattentive/Lost in Thought	**1**	**27**
Unknown Distraction	**7**	**23**

Further Definitions

4.25 This analysis also gives further definitions of specific examples of distracters. For the 'Outside person, Object or Event' category these are as follows.

- 'Outside Traffic/Vehicle: Examples include Vehicle swerved, turned in front of, changed lanes, slowed or stopped, encroached on lane, emergency vehicle, bright vehicle police lights, etc.
- Police: Examples include 'Being chased by, officer directing traffic, thought saw police, other'
- Animal in Roadway: 'Examples, deer, dog, elk, other.
- People/Objects in roadway. Examples: child in road, basketball game, crowd, broken glass, garbage can etc.'
- Other. Examples: 'waved ahead by driver, another person or driver, parachutes in sky, bicycle toll booth, brush obstructing vision, tire blow-out etc.'

Used with permission of the author and the Scottish Government.

4.26 The 'Other' category has been included in table 4.3 above, because the examples make clear that some of its sub-categories refer to external-to-vehicle distraction: for example, 'Other Distraction: Looking Outside Window: Examples, 'in rear view mirror, at road signs, in store window, for gas station, for parking space, for business etc.''

4.27 Also 'Other Distraction: Other' contains the example of 'sun glare' again, arguably, an external distracter. (Note: there is no doubt that sun glare 'distracts attention': (Finlay and Wilkinson, 1984): the question is whether it is genuinely external or not).

4.28 In short here are the totals.

Total. **332** (1997)

412 (1998).

- Percentage of outside distracters excluding Other Distraction: 'Looking Outside Vehicle'. **28.9%** (1997).
- Percentage of outside distracters excluding Other Distraction: 'Looking Outside Vehicle' **30.3%** (1998).
- Percentage of outside distracters including Other Distraction: 'Looking Outside Vehicle' **31.3%** (1997).
- Percentage of outside distracters including Other Distraction: 'Looking Outside Vehicle' **32.5%** (1998).

4.29 Given that CDS data External-to-vehicle distraction varied from 19.8% (1998) to 35.4% (1997), the data above falls between the expected parameters, and demonstrates that, very roughly, based on this data, external-to-vehicle distraction was stated as a cause for about a third of all events where 'driver distraction' was noted in the police forms.

THE SUSSMAN STUDY

4.30 Sussman, Bishop, Madnick and Walter (1995) carried out a study of 1982 NASS data (1982 was the first year that 'driver related factors' were noted in the database). The first thing that should be noted about their study is that their definition of driver inattention is 'the attentional state where the driver fails to respond to a critical situation' (Sussman et al, 1995). This is rather different from the more standard definition quoted on paragraph 2.1, above. Since they discovered that in 37% of accidents in the database the driver took no action to avoid the collision, they infer that this 'suggests' that attentional lapses are a major factor in highway accidents. However, they admit that only 8% of accidents listed in the database were defined as being caused specifically by driver inattention. The use of only one year for analysis is another handicap. The paper contains no data on external driver distraction.

Used with permission of the author and the Scottish Government.

WANG KNIPLING AND GOODMAN

4.31 Another important study is the Wang Knipling and Goodman study of 1996. This used the CDS database from one year (1995). It is particularly important in that the CDS database was created to be nationally representative, in a way that more localised databases were not. Moreover, it used a high number of cases (4,536). The main problem with this study is the fact that it only took one year's data: it is unknown how 'average' 1995 was as a year for distraction incidents. Moreover, as the authors themselves point out, the CDS 'was not originally intended to collect crash causation data' (Wang, et al 1996: 11), and, given that CDS uses accident investigation methods, it must be noted that accident investigations are retrospective and that they are always, therefore, to a certain extent conjectural.

4.32 The method of analysis is also noteworthy in terms of representativeness. The authors note that 'if any involved driver was coded as exhibiting some form of driver inattention, the whole crash was classified under this category' (Wang et al op cit: 4): thus making a large assumption, that because one driver was classified as being 'inattentive' this therefore proved that inattention was the chief contributory factor to the crash. Table 4.4 below shows the data relating to attention.

Table 4.4

Data Element	% of drivers	% of crashes
Attentive or not distracted	46.6%	28.4%
Looked but did not see	5.6%	9.7%
Distracted by other occupant (specified)	0.9%	1.6%
Distracted by moving object in vehicle (specified)	0.3%	0.5%
Distracted while dialling, talking, or listening to cellular phone (location and type of phone specified)	0.1%	0.1%
Distracted while adjusting climate controls	0.2%	0.3%
Distracted while adjusting radio, cassette, CD (specified)	1.2%	2.1%
Distracted while using other device/object in vehicle (specified)	0.1%	0.2%
Sleepy or fell asleep	1.5%	2.6%
Distracted by outside person, object or event (specified)	**2%**	**3.2%**
Eating or Drinking	0.1%	02%
Smoking-related	0.1%	0.2%
Distracted/inattentive, details unknown	1.5%	2.6%
Other distraction (specified)	1.3%	2.2%
Unknown/no driver.	38.5%	46%

Weighted Driver N=4627000 (7943 unweighted) Weighted Accident N=2619000 (4536). In order for an accident to be classified 'attentive' all involved drivers had to be classified 'attentive'.

4.33 Therefore, Wang et al found that 7.8% of drivers and 13.3% of accidents were associated with driver distraction.

WIERVILLE AND TIJERINA

4.34 In 1996 Wierville and Tijerina conducted an accident base search using search keywords, on the North Carolina accident data base, which contains almost all police reported events in the state. Again, the authors developed their own definition of driver

Used with permission of the author and the Scottish Government.

distraction, describing it as problems 'with visual allocation and visual workload': audible and other distracters were therefore not discussed. The search period was on 1989 and the first four months of 1992: as with the Wang et al study it is not clear how representative a sample this was. The 1989 database contained 189,164 records, and the four months of 1992 contained 61,707. The word search located 14,372 possible visual allocation issues from 1989, and 3,247 from 1992. After closer inspection, it was decided that 2,816 were in actual fact visual allocation issues. Of these 1,562 were internal-to-vehicle visual allocation issues, 661 were external-to-vehicle visual allocation issues, and 593 were unknown. Therefore 1.48% of reported accidents in 1989 were noted as involving driver distraction, and 0.34% percent of reported accidents involved external-to-vehicle driver distraction. The 'raw' data for 1991 was not quoted. Unfortunately as the study was investigating mainly internal-to-vehicle distraction, there was little information given about the nature of the external distracters. However, it was noted that 50 events (out of 189, 464) were classed as issues to do with mirrors (e.g. 'observing external vehicle, pedestrian, object, animal etc.), and that a further 41 were 'mirror' incidents where the distracter was unknown.

Problems with Wierville and Tijerina

4.35 Wang et al (1996) point out that the Wierville and Tijerina study has figures for distraction considerably lower than the majority of other studies. They suggest that this is because the North Carolina database includes only data concerning accidents where property damage was over $500. They also suggest that perhaps the North Carolina PAR does not have a field for 'inattention or distraction'. This emphasises a point made earlier: *numbers for contributory factors will be different depending on whether drivers are specifically asked whether something might be a factor, or if they are left to volunteer the information themselves.*

STEVENS AND MINTON

4.36 Stevens and Minton are of particular importance in this respect in that their study was carried out in the UK. However, it should be noted that the database used covered England and Wales only, and that generalisations to Scotland should be made with care.

Methodology

4.37 Minton and Stevens gathered data from fatal accident reports in England and Wales between 1985 and 1995 and 'coded' them themselves to create a quantitative variable: 'distraction'. As well as this, the degree of certainty as to the extent to which the event really was a 'distraction' event was also noted. For example, if the driver admitted he was distracted, this was 'certain'. If there was strong circumstantial evidence '(for example, the driver died, but was found with a cassette or mobile phone in his hand) this was classed as 'probable'. If there was weak circumstantial evidence this was classed as 'possible'. Unfortunately the published paper only dealt with internal to vehicle distractions but the current database now contains 123 accidents involving external-to-vehicle distraction (Minton, 2003) This constitutes a percentage of 1.06% from a total of 11,529 fatal accidents logged in the database.

Used with permission of the author and the Scottish Government.

Department for Transport

4.38 Brown (2001) wrote a paper reviewing an earlier paper by Sabey and Staughton (1975) reviewing the 'looked but failed to see' accident causation factor in the UK. Sabey and Staughton carried out research on a database of 2130 event reports, which were coded by researchers to create 3704 driver errors from 2130 accidents. These are listed in Table 4.5 below.

Table 4.5

Driver Error	No. of Errors	Driver Error	No. of Errors
Lack of Care	905	Following too close	75
Too Fast	450	Difficult Manoeuvre	70
LBFTS	367	Irresponsible/ Reckless	61
Distraction	**337**	Wrong Decision/Action	50
Inexperience	215	Lack of Roadcraft	48
Failed to Look	183	Faulty Signalling	47
Wrong Path	175	Lack of Skill	33
Lack of Attention	152	Frustration	15
Improper Overtaking	146	Bad Habit	2
Incorrect Interpretation	125	Wrong Position	7
Lack of Judgement	116	Aggressive	6
Misjudged speed/distance	109	**Total**	**3,704**

4.39 Therefore distraction accounted for 9.09% of contributory factors listed, and 15.8% of accidents had distraction given as a contributory factor.

4.40 Brown (1984) reanalysed this data and eliminated accidents which occurred at night, or where the driver was under the influence of alcohol, drugs, fatigue or illness, in order to study perceptual errors more closely (Shown in Table 4.6).

Table 4.6

Perceptual Factor	% Contribution to Driver's Errors
LBFTS	22.8
Distraction	**15.4**
Lack of Attention/Alertness	8.1
Faulty Interpretation	6.6
Misjudged speed/distance	5.6
Any Perceptual Factor	**49**
Any Non-Perceptual Factor	**51**

Note: '49%' is not simply the sum of contributions by the individual listed factors because some accidents were associated with more than one perceptual factor.

4.41 Unfortunately, this study was more concerned with Looked but Failed To See Errors (LBFTS) and so the 'distraction' category was not broken down further into 'internal' and 'external'. Nevertheless it is clear that distraction accounts for a large percentage of driver errors leading to accidents in the UK.

Used with permission of the author and the Scottish Government.

THE KOSTYNIUK-EBY STUDY

4.42 One of the few exceptions to the rule that only questionnaire data is used in the study of driver distraction is the Kostyniuk and Eby (1998) study of Rear-End Roadway Crashes, conducted by the University of Michigan for Honda. Kostyniuk and Eby conducted focus groups with Michigan drivers who had had rear-end accidents, and asked them why the accidents had occurred. The main drawback of the study is that, as the authors state, this was an exploratory study, with small numbers (N=16, plus N=10 for separate telephone interviews). Its generalisability is therefore questionable.

4.43 The results of the focus group studies as regards what factors contributed to the crash are shown in Table 4.7.

Table 4.7

Road Design	Environment	Actions of Other Driver	Vehicle Problems	Personal Error (inattention, distraction)
7%	9%	49%	4%	**31%**

4.44 Interestingly, drivers mentioned road design, something not mentioned in the other studies (presumably because there was no entry for it in the form). Actions of other drivers features prominently, but it must be remembered that this study examined rear-end collision only.

4.45 Unfortunately, again, driver distraction was not divided into external-to-vehicle and internal-to-vehicle. Nevertheless, it does show that drivers consider inattention/distraction to be the major contribution to this kind of accident, insofar as drivers feel the accident was 'their own fault'. Further questioning in the focus groups of 'personal error that caused your accident' makes this clearer (Table 4.8).

Table 4.8

Divided Attention	Incorrect Assumption (non-normative)	Incorrect Assumption (normative)	Unavoidable
32%	32%	8%	28%

N=25

4.46 Finally, two Scottish studies were carried out specifically for this research.

FIFE CONSTABULARY

4.47 This study consisted of 21 records made available with the kind help of Sergeant Andy Edmonston, Traffic Management Sergeant of Fife Police force. It should be noted that there seems to be some confusion in the use of the phrase 'external distraction' in this

Used with permission of the author and the Scottish Government.

database in that many of these cases of 'distraction' were (for example) situations in which a pedestrian walked in front of the car. Moreover, many of the examples in the 'animal' category were cases in which an animal moved in front of a moving car and the car had to swerve unexpectedly.

17 of the drivers were male, 4 female.

The average age was 47.38

The categories are as follows (Table 4.9).

Table 4.9

External-to-vehicle Distracter	Number of Cases and %	
	Number	%
Other Vehicles (including lights)	9	42.87%
Pedestrians	5	23.80%
Animals	4	19.04%
Sunglare	2	9.52%
Unknown	1	4.76%

It should be noted that 'sunglare' could also be described as 'internal' distraction.

4.48 It must be stressed that due to the small numbers this list should be treated with caution. Moreover, the definition of 'distraction' seems to be relatively wide.

CENTRAL SCOTLAND POLICE ROAD ACCIDENT DATABASE

4.49 Contact was also made with Records Bureau Supervisor Stuart MacFarlane of the Central Scotland Police force, who kindly agreed to help with this study. Since 1999, as a trial project, police officers investigating accidents must fill in a 'contributory factor' box in the accident report form, which is then stored on an electronic database. As part of a preliminary search, 58 possible accidents were selected as external-to-vehicle distraction, but after a search of the database, it was decided that only 26 accidents genuinely fitted this description. 765 accidents (in total) were reported in 1999, 672 were reported in 2000, 637 were reported in 2001, and 597 were reported in 2002 (up until October: the results for November have not been calculated at time of writing). Therefore, 2,671 accidents were reported in total in this time period. Therefore 0.97% of the accidents in the database were classed as being 'external-to-vehicle distraction'.

4.50 The drivers who claimed to have been distracted (by a factor that was external to the vehicle) were overwhelmingly male (only 15.4% were female). The average age was 37.2.

4.51 The breakdown of the contributory factors is as follows (Table 4.10). (Note: percentages have been rounded up and so will not necessarily add up to 100%).

Used with permission of the author and the Scottish Government.

Table 4.10

External-to-vehicle Distracter	Cases	
	Number	%
Other vehicle	10	38.46%
Animal	5	19.23%
Pedestrian/actions of pedestrian	3	11.53%
Sunglare	2	7.69%
Children	1	3.85%
Unknown	5	19.23%

4.52 It should be noted that 'other vehicle' includes actions of another driver, and both moving and stationary traffic, and police cars (it also includes one accident where the driver was distracted by another car accident). The 'unknown' category describes a situation where no details of any sort were available: therefore the distracter may have been internal or external to the vehicle. The high percentage of 'animal' distractions may be accounted for by the rural nature of this area (amongst the animals that distracted drivers were a swan and a fox). It is clear that the behaviour of other drivers/vehicles is the major external-to-vehicle distraction (38.46%). It is also clear that despite small numbers, this study replicates (roughly) the Sussman, Bishop, Madnick and Walter study, in that other vehicles, sunlight, and animals are considered to be major distractions, with other vehicles being the largest category.

4.53 It may be thought that the numbers for external-to-vehicle distraction in the above studies are rather small. However three strictures should be borne in mind.

1. As stated earlier, if billboards etc. do have an effect on driver behaviour it may well be unconscious. Some of the experiments showed distraction times of under a third of a second: insignificant in terms of normal driving experience, yet large enough such that, over time, a sizeable effect could build up.

2. These databases are based on qualitative data. Mostly it is taken from drivers themselves. Even in instances when the police provide the 'accident cause', this is normally provided by simply asking the driver. Nor is the situation fundamentally different when trained 'accident investigators' are involved: if the qualitative data is not provided (that is, the driver simply does not state that he was distracted by, for example, his mobile phone, and hides the phone) there is no reason for the official to note the phone as a contributory factor to the accident.

3. Finally, a database is only as good as the taxonomy that orders it. However, many of the taxonomies presented here have taxonomic classifications that are ambiguous in the extreme, and have many confounds. Frequently, terms such as 'distraction' and 'external' are not given agreed upon definitions, and so the same event can be classified in a number of ways depending on the 'whim' of the classifier (for example, is sun glare external-to-vehicle or internal-to-vehicle?).

Used with permission of the author and the Scottish Government.

Therefore information from these databases should be viewed with a great deal of scepticism. As the following chapters will show, there is a great deal of information that external-to-vehicle distraction is a real and present danger on Britain's roads.

Summary

4.54 Data for distraction is complex and contradictory. It is likely that distraction accounts for roughly between 10% and 30% of all accidents, but given the margin of error, this should be treated as a highly tentative conclusion.

Used with permission of the author and the Scottish Government.

CHAPTER FIVE INTERNAL TO VEHICLE DISTRACTION: MOBILE PHONES

5.1 Since 1990 there has been a great increase in studies on the possible safety effects of mobile phones. It is likely, in fact, that there is a relationship between the increase in studies on this subject and the comparative decrease in studies on external-to-vehicle distraction (for example, billboards). This subject is not, strictly speaking, relevant to the study of external-to-vehicle distraction. Nevertheless, a brief discussion of mobile phone use and its impact on accident rates will help to demonstrate the difficulties of demonstrating causal links between such complex phenomena.

KINDS OF STUDIES

5.2 As noted before, FARS and NASS are the major databases concerned with car accidents in the US. Therefore it is important to note that only Minnesota and Oklahoma included data relevant to mobile phone use on their Police Accident Reports. Given that causal elements in fatal crashes are generally considered to be more reliable in terms of assessing numbers (given that fatal accidents are rarely not reported) the low numbers should be noted. For example, from the FARS database, only 2 incidents where mobile phone use played a part in a fatal accident were reported in 1994, and only 1 in 1995. However, having said that, it does appear, at first glance that 'the NASS and FARS files, and anecdotal observations of driver performance, [...]' demonstrate 'an apparent link between cellular telephone use and driver inattention'. (Goodman et al, 1997: Chapter 3: 13). However, proving that this is the case, and then making the leap to associating driver inattention (caused specifically by mobile use) to crash rates is more difficult.

5.3 A more complex analysis of the raw data demonstrates that there does seem to be a correlation between mobile phone prevalence and mobile phone related accidents. However, if the data are analysed such that the number of accidents is divided by the number of mobile phones in use in that year (in other words, the accidents are expressed as a percentage of mobile phones in use) then mobile phone related accidents are seen to be *decreasing* (Goodman et al, 1997: ch. 4: 11). This is compatible with the Neisser theories discussed earlier, in which multi-tasking is a skill. When mobiles were introduced they were a safety hazard because people had not learned to drive and talk at the same time. Therefore, accident rates rose. However, after a while, this effect peaked and then, as drivers learned this skill, declined.

5.4 Of course, there may be other reasons for this statistical pattern, which again indicate the difficulties in this kind of study. It may be that the increasing prevalence of hand held phones (as opposed to in-car phones) facilitates drivers hiding their phone in the event of an accident and then denying that they were talking on the phone for insurance or legal reasons. Alternatively, phones might be becoming easier to use, and hence safer (Goodman et al, 1997 Chapter .4:14).

Used with permission of the author and the Scottish Government.

LAB STUDIES

5.5 The classic demonstration of the deleterious effect of mobile phone use on performance was Brown, Tickner and Simmonds (1969). In this experiment, subjects carried out a task (basic logical questions) relayed to them by in-car telephone while driving. Results suggested that driving ability was reduced during task performance. The fundamental problem with this experiment, of course, was ecological validity (that is, how 'realistic' the experiment was). Specifically, there were no serious consequences to making a driver error. Therefore it may have been that subjects spent more time thinking about the telephone task than they would have done 'in real life'. If this is the case, then this is a case of 'absorption' rather than distraction (Tellegen, and Atkinson, 1974). That is, drivers became too absorbed in the task, and devoted insufficient concentration to the driving task. Given that absorption, as previously discussed, is related to 'highway hypnosis' and the 'moth effect', this might be better conceptualised as drivers finding a task (talking on the 'phone) as being (comparatively) more interesting than the more monotonous driving task, rather than as an example of 'cognitive overload'. Of course, most telephone conversations are rather easier to follow than the complex logical questions used in this task.

5.6 Drory, (1985) carried out an experiment in which truck drivers drove a simulator and were asked to perform a very easy verbal task via hands-free phone during a 7 hour driving course. This actually *increased* driver performance, supporting a point made in section 3.44. In monotonous driving conditions, additional stimulus in the form of information can help maintain arousal and keep drivers alert (of course, if the task was *too* 'interesting' this might have led to a decrease in performance due to absorption, as above).

EPIDEMIOLOGICAL STUDIES

5.7 The major advantage of epidemiological studies is of course that they contain 'real world' data. The major disadvantage is that correlation does not imply causation. That is, even if the statistical tests used are beyond reproach, and the data is trustworthy, then even perfect correlations do not prove causal relations. This point has been made before, but is worth stressing.

5.8 The classic study in this regard is Redelmeier, D, Tibshirani, R. (1997) (published in the highly prestigious New England Journal of Medicine) which has often been claimed to have provided proof of the causal connection between mobile phones and accidents.

5.9 The authors studied 699 Toronto drivers who had had crashes and who owned mobile phones. Each person's mobile 'phone records were studied through their billing records. This was then cross-referenced with the time of their accident. Their conclusion helped to make the study famous: that the relative risk of having a crash whilst using a cellular telephone was estimated to be the same as that of driving while at the legal limit of blood alcohol.

5.10 To reiterate, this is by far the best and the most comprehensive of the epidemiological studies. And since this is an epidemiological study it must be pointed out, yet again, that this kind of study cannot demonstrate that mobile phone use causes car accidents. However, even with this caveat, there are grounds for caution.

Used with permission of the author and the Scottish Government.

5.11 Firstly, and most importantly, the authors made a distinction between accident times that were 'exact', and accident times that were 'inexact'. 'Exact' times were accident times which could be substantiated from at least three separate sources: personal recollection, police records, and telephone listings to emergency services. Inexact times where fewer than three of these data were available. 33% of the crash times given were exact, and the remaining two thirds were inexact. Therefore only a third of the time data used for the correlations were *known* to be accurate. Moreover it should be remembered that personal recollection of accident time (even when taken on the spot) might be inaccurate. How many drivers who have had an accident immediately check their watches to find out the exact time at which it happened? And who checked whether the driver's watch was fast or slow?

5.12 Police records might seem to provide a check on this phenomenon, until it is realised that in many cases the police estimate the time of the accident by asking the driver. Using telephone records to emergency services as an 'objective' check on these two estimates presupposes that all drivers immediately (or at least within a minute or so) phone the emergency services. Surely, however, many drivers would be briefly unconscious immediately after the accident, or, if not, would check that the occupant of the other vehicle was uninjured or needed first aid, before calling for help.

5.13 If this is the case, then cross-tabulation of mobile phone records and accident times becomes extremely problematic. Crudely put, how do researchers know that drivers were actually on the phone *at the time of the accident*? This problem is made worse by the fact that the authors analysed their data on five minute 'time intervals'. However the average call length in this study was 2.3 minutes. Therefore, even if a call was made in the five-minute interval before an accident, this does not prove that the driver was on the phone at the time of the crash. In any case, as the authors themselves point out, they did not take 'culpability' into account. That is, the police or the courts did not necessarily decide that the driver using the mobile 'phone actually caused the accident. Mobile phone use may just have been a coincidence, with the accident being caused by another driver (who was probably *not* using their mobile 'phone at the time of the accident).

5.14 Therefore, even this study, which seemed to prove a correlation (NOT a causal relation) between mobile 'phone use and accident rates must be treated with extreme caution. It should be noted that there has been far more work done on mobile phones and accidents than on external-to-vehicle distraction and accidents. The fact that, as of yet, there is no proof that mobile phone use causes accidents (although there is much circumstantial evidence) indicates that the relationship between external-to-vehicle distraction and accidents is likely to be even more tenuous.

Used with permission of the author and the Scottish Government.

CHAPTER SIX EXTERNAL TO VEHICLE DRIVER DISTRACTION

6.1 As discussed in section 2.5.2 above, there are individual differences in attentional abilities, and these are also probably affected by factors like alcohol consumption and fatigue. However, how these relate to External-to-vehicle distraction is unclear. Fortunately, the AAA study has detailed information on a number of other variables that help provide information on this specific situation.

AGE AND EXTERNAL TO VEHICLE DRIVER DISTRACTION

6.2 Table 6.1 shows the 'raw figures' and percentages for the relationship between age and external-to-vehicle distraction.

Table 6.1

	<20	20-29	30-49	50-64	65+
External-to vehicle driver distraction	**27 % (5.9)**	**29% (4.3)**	**27.5% (2.1)**	**33.3% (9.2)**	**42.8% (13.5)**
Adjusting radio/cassette/CD	28.9 (12.1)	7.9 (3.3)	7.3 (3.3)	0.6 (0.4)	0.2 (0.2)
Other Occupant	10.7 (2)	17.8 (4.7)	9.8 (2.4)	1.5 (1)	2.6 (1)
Moving Object in Vehicle	5 (4.4)	2.4 (0.9)	6.5 (4.1)	3.6 (2.1)	.1 (.1)
Other Device/Object	1.3 (0.6)	2.7 (0.9)	4.2 (1.6)	4.4 (3.2)	1.4 (1)
Vehicle/Climate Controls	3.1 (1.5)	2.1 (0.5)	3.3 (1.2)	3.4 (2)	1.8 (1.7)
Eating, Drinking	1.1 (0.5)	1.4 (0.6)	1.1 (0.4)	7.9 (2.1)	0.5 (0.6)
Using, Dialling on Mobile	0.1 (0.1)	1.1 (0.3)	3.3 (1.2)	0.1 (0.1)	2.3 (2.1)
Smoking Related	0.9 (0.4)	1.1 (0.3)	1 (0.5)	0.3 (0.3)	0
Other Distraction	19.4 (4.2)	12.4 (2.9)	25.7 (3.1)	34.5 (6)	45 (11.7)
Unknown	2.5 (.6)	12.4 (2.9)	10.5 (3.8)	10.3 (6)	3.2 (1.5)
TOTAL	23	26.8	34	9.2	7.1

6.3 The number in brackets indicates the standard error. The percentages indicate percentages of the totals (i.e. external-to-vehicle distraction as a percentage of all distractions). It is clear that drivers state that they are more prone to external-to-vehicle distraction as they get older. This should be compared with, for example, potential to be distracted by the radio/cassette/CD which declines from 21.1% to 0.2% in the youngest to oldest age group (Stutts et al, 2001: 16).

6.4 In terms of gender, females were slightly more likely to be distracted by external factors than males (30.5% (2.7)) as opposed to (28.9% (3.7)).

Used with permission of the author and the Scottish Government.

6.5 Another study studied age and its impact on distraction in particular (Lam, 2002). Data from New South Wales Police was analysed using an established accident cause analysis methodology and the following data produced relating to deaths and injuries.

Table 6.2

Age	Internal to Vehicle Distraction		External to Vehicle Distraction	
	Number	%	Number	%
16-19	246	3.43%	213	2.97%
20-24	197	2.01%	222	2.77%
25-29	144	1.86%	181	2.34%
30-39	221	1.85%	233	1.92%
40-49	88	0.95%	163	1.76%
50-69	84	0.92%	179	1.96%
70+	90	1.44%	139	2.22%

Distraction-related death and injuries 1996-2000. Percentages indicate percentages of total deaths and injuries (Lam, 2002: 415).

6.6 It can be seen that external-to-vehicle distraction are consistently higher than internal-to-vehicle distraction and that the percentage lowers towards middle age, and then increases as the driver becomes older.

ROAD TYPE AND EXTERNAL TO VEHICLE DRIVER DISTRACTION

6.7 This table (6.3) seems to indicate that external-to-vehicle distraction is particularly prevalent at intersections, and, to a lesser extent, >2 lane roads (motorways and highway). This is consistent with the laboratory evidence quoted earlier, in which distraction due to 'clutter' (particularly at intersections/junctions) will be particularly prevalent, and also that distraction may well be associated with (featureless) motorways as well (Note: figures in brackets indicate standard errors).

Used with permission of the author and the Scottish Government.

Table 6.3

Driver Distraction	>2 lanes	Speed limit/45 mph	Non-level grade	Intersection/junction
External-to-vehicle driver distraction	**34.3% (3.2)**	**24.3% (6.2)**	**32% (4.2)**	**51.8% (4)**
Adjusting radio/cassette/CD	24.7 (12.5)	18.8 (2.8)	49.1 (16.9)	30.6 (13.1)
Other Occupant	49.1 (8.3)	23.3 (4.4)	37.5 (14.4)	61.7 (8.5)
Moving Object in Vehicle	18.5 (12.2)	9.7 (5.8)	67.8 (14)	50.8 (10.9)
Other Device/Object	41 (12.3)	13.7 (7)	52.9 (16.7)	43.9 (10.8)
Vehicle/Climate Controls	37.1 (12.7)	12.8 (6.6)	26.4 (8.7)	46.8 (14)
Eating, Drinking	24.1 (6.6)	33 (8)	29.6 (11.3)	27.4 (5.8)
Using, Dialling on Mobile	42.3 (16.4)	8.9 (7)	19.6 (8.8)	56.5 (1.8)
Smoking Related	39.6 (18.8)	17.1 (10)	36 (16.8)	36.3 (7)
Other Distraction	33.8 (6.8)	20 (3.1)	35.5 (6.4)	49.4 (6.3)
Unknown	66.9 (3.1)	14.8 (3.2)	21.8 (9.8)	68.8 (5.3)
Overall	37.1	20.2	36.4	50.4

WEATHER AND EXTERNAL TO VEHICLE DRIVER DISTRACTION

6.8 Table 6.4 shows data pertaining to weather conditions and external-to-vehicle distraction. There seem to be no specific events or correlations in this table that are of interest (again, figures in brackets indicate standard errors).

Used with permission of the author and the Scottish Government.

Table 6.4

Contributing Factor	Non-daylight	Adverse weather	Non-passenger car	>1 occupant
External-to vehicle distraction	**29.9% (3.5)**	**16.2% (4.9)**	**23.7% (2.2)**	**27.5% (3.1)**
Adjusting radio/cassette/CD	63.7 (3.5)	46 (14.3)	21.7 (5.9)	63.6 (20.8)
Other Occupant	38.9 (9.8)	16.4 (3.3)	24.6 (10.3)	99.8 (.2)
Moving Object in Vehicle	40.4 (5.6)	4 (2.6)	20.2 (10)	5.6 (3.2)
Other Device/Object	26.4 (9.4)	2.2 (1)	26.2 (10.2)	19.1 (11)
Vehicle/Climate Controls	40.6 (11.6)	5.6 (5.6)	23 (5.1)	51.7 (14.3)
Eating, Drinking	31.2 (9.2)	11.9 (6.5)	46.4 (8.2)	11.3 (4.1)
Using, Dialling on Mobile	53 (12.5)	11.1 (7.9)	45.9 (17.4)	14 (8.4)
Smoking Related	88.2 (5.3)	.5 (.5)	37.9 (13.5)	27.2 (8.6)
Other Distraction	25.4 (4)	6.7 (2.5)	33.6 (4.6)	25.3 (4.6)
Unknown	19.3 (3.7)	14.1 (7)	37.7 (12.1)	37.1 (11.1)
Overall	34.2	15.5	28	38.7

Used with permission of the author and the Scottish Government.

CHAPTER SEVEN SPECIFIC STUDIES: BILLBOARDS

7.1 It may seem obvious that the distraction phenomena most regularly given as the primary causal factor in the various studies carried out (for example, the Tri-level study) would be the phenomena that have been most studied in the various experiments and studies that have been performed since. However this is not the case. Science is a social process, and in the study of safety, social and political pressures have a stronger influence than in many other fields of science. Experiments and studies take place when money is available for the research, and, therefore, experiments which are easy to carry out and might lead to definite alterations in safety legislation will be prioritised over more 'theoretical' experiments. So studies on whether children, or the police (or other accidents) function as distracters are few and far between. This is mainly because until recently the technological ability to create simulations of complex dynamic situations (such as a child running into the road) in a laboratory setting was not available (one of the very few attempts to model dynamic situations is Berkhout, 1979). Even now that this can be done it is difficult to set adequate experimental controls (part of the reason mobile phone experiments as described in section 4 are so popular is that they are presumably reasonably easy to do). The behaviour of children (or the police) is infinitely variable, and it would be very difficult to make strong inferences from even worthwhile experiments. Moreover even if the results *did* indicate that distraction could follow in these situations, it is difficult to see what specific safety improvements this would lead to.

7.2 More work has been done on billboards/safety signs etc., and it is on these features that this chapter will concentrate. Billboards are static (as opposed to dynamic) and standardised. In other words it is easier to carry out actual experiments and studies, and easier to make inferences as to safety events in the real world. Therefore billboards are a 'test case' for this sort of distraction. If billboards can be demonstrated to be distracters it seems possible that other features can be as well, and that the more complex experiments that would be needed to test this hypothesis should take place. On the other hand if the results from billboard studies are too ambiguous to draw definite conclusions from, then it is highly likely that in studies of more diffuse and complex phenomena the results would be even more ambiguous.

7.3 One thing should be repeated: it does not follow from the fact that billboards are not provided as explanations for crashes in police records that they therefore do not function as such. To quote Shoaf: 'The fundamental precept of advertising is its impact on the subconscious mind. Therefore if an accident has been directly or indirectly caused by the attention of a motorist being subconsciously attracted away from the highway by an advertising sign, he would not, of course, be in a position to testify that the presence of the sign was even a partial cause for the occurrence of the accident.' (Shoaf, 1955: 71). This is yet another reason why the qualitative studies of accident causation such as Treat et al (op cit.) should be treated with caution.

THE LEGAL POSITION

7.4 There are many legal guidelines for the placement of adverts and signs by the side of the road. For example, 'Road Geometry' (2001) states ''Types of advertisement likely to cause danger to road users, and are open to control on public safety grounds are those that: -

Used with permission of the author and the Scottish Government.

- Impair sight lines at corners, bends, junctions or accesses.
- Obstruct traffic signs or signals or *are likely to distract road users because of their unusual nature*
- Leave insufficient clearance for vehicles on the carriageway' (Department for Transport, 2001: 10/11) (italics added).

7.5 However, to quote Holohan (1979) 'Most cities have ordinances regulating the extent to which advertising can distract a driver's attention, yet they are often couched in ambiguous terminology and are based on policy makers' hunches rather than on actual safety evidence' (Holohan, 1979: 8). Moreover, Johannson discovered that most drivers have a poor recollection of any road signs they saw while travelling, suggesting that visual stimuli of this sort are not often brought to conscious attention. However, this would not affect the findings of experimental studies concerning *involuntary* (unconscious) saccades (Johanson and Rumar, 1966: Johannson and Backlund, 1970).

7.6 Before going on to ask about the actual safety evidence Holohan's next sentence should be borne in mind. 'On the whole it appears that there has been very little actual research on potential distracters in field settings. Most of the research that has been done was completed nearly two decades ago. Many of the results are equivocal.... and based on either purely correlational data or on data resulting from poorly designed field experiments.' (Holohan, 1979: 8). The situation has not improved much since 1979.

THE STUDIES

7.7 The first studies that will be looked at are correlational studies. A point that should be made about the correlational studies is that they tend to classify distracters as if objects within a classification are all roughly the same. For example (that, if taverns and gas stations are classification categories) all taverns and gas stations are roughly the same size, height, have roughly the same number of customers and so on. This may be justified in terms of gas stations and taverns (or on the other hand it may not), but it is doubtful whether this methodology is the best one for billboards, signs, and other visual distracters. Some signs are large, some are small. Some are illuminated, some are not. Some carry complex messages, others do not. This is important as the evidence (presented below) suggests that the effects of signs/other distracters are *situational.*

THE NORTH CAROLINA STUDY

7.8 In 1974, the Highway Safety Research Centre in North Carolina carried out a wordsearch on their electronic database containing over 200,000 accidents. A number of words and phrases pertaining to advertising, signs and billboards were selected, and then accident reports which contained these words were selected and analysed. Amongst the phrases used were 'sign', 'eyes off the road' 'billboard', and 'distracted'. However, the study failed to provide any hard evidence that this form of distraction was a major contributory factor to accidents. The main problem with this study, apart from the relatively unsystematic methodology, was the fact that the search is only as good as the qualitative data held on the database, which is prone to various biases as detailed in paragraph 2.18, above (Anonymous, 1974).

Used with permission of the author and the Scottish Government.

THE ADY STUDY

7.9 In 1967 Ronald Ady carried out one of the best studies into the issue of billboards and their effects on the accident rate. This was one of the best studies in this area because it was not merely a search through the databases (like the North Carolina study) or a correlation study (which cannot prove causation). Nor was it a laboratory study (with the concomitant problems of ecological validity). Instead, it was a simple before and after study with a control: still one of the best ways of analysing an effect.

7.10 Ady's study was an attempt to deduce whether Broadbent's 'filter' theory of attention or Hebb's 'arousal' theory was the best one to explain distraction and attention. He located nine advertising signs that met the criteria for 'distraction' he had set out. That is, they were large, (at least 15 feet by 50 feet), illuminated, and information rich (for example, a weather forecast or news information). Accident rates were studied monthly for one year before and one year after the signs were erected: however, adequate data was available for only three of the nine signs. An area of road on the same highway was used as a control (to allow for rate of traffic flow). The two year study period was used to allow for the Hawthorne effect: given that, in Hebb's theories, to begin with the advertising would function as a novel (and hence) arousing element, but that as the information was repeated, the level of arousal level would decrease. Ady stated that to the best of his knowledge there were no other variables that could account for change in accident rates.

7.11 Ady discovered that two out of the three signs did NOT produce alterations in accident rates. However, the third sign DID produce a level of alteration at the 5 % significance level.

7.12 Ady deduced from this that whereas billboards and signs did not *necessarily* produce a distracting event, in the right situation it was *possible* that they did. He pointed out that the third sign was placed on the corner of a sharp bend, and that in some ways it was the most conspicuous sign (with bright white lights, which were removed six months later after pressure from state highway officials). This bears out the point of Bahcall and Kowler, 1997: that it is not so much the stimulus in itself as the relationship between the stimulus and other aspects of the perceptual field that causes distraction.

7.13 Ady argued that although the results were not entirely clear, it seemed to be evidence in favour of Broadbent's theories. However it is also possible to see this as bearing out Holohan's idea (1979), that the real danger was of *surprise* (as in the theories of Berlyne) in a situation where the driver felt him/herself to be safe. One does not normally expect bright flashing fifty foot signs to be placed on sharp bends. It is also possible that the bend did not look as sharp as it actually was, and that the driver felt him/herself to be safe, and that the surprise of seeing the sign caused accidents.

7.14 As mentioned above this is one of the best studies performed in this field. However, it is open to criticisms. Firstly, there are the small numbers: the fact that only the third sign showed a statistical significance might be explained by 'regression to the mean' (that is, that in the year previously accidents rates had been abnormally low, and that this was merely a statistical 'recovery' to the normal rate): this is particularly important as it is not made clear whether the 'control' area for sign three also contained a sharp bend (Elivk, 1997). Moreover Ady fails to describe the road that precedes the bend. The Minnesota Highway Department

Used with permission of the author and the Scottish Government.

has demonstrated that sharp bends following long, monotonous stretches of road are more dangerous than sharp bends following short lengths of road. This would therefore be evidence for 'highway hypnosis' (or even, if the billboard was 'absorbing', phototaxis), and would therefore tend to support Hebb's conclusions, not Broadbent's (Lauer and McMonagle, 1955).

7.15 Ady's use of all accident rates as opposed to merely fatal accidents might be criticised: generally non-fatal accidents are under-reported, and 'differences' in rates can be the result of different reporting strategies. Fatal accidents, on the other hand, are almost always reported, and treated in the same way. Moreover, Ady's report contains little 'raw data' (it only contains statistical data), and is somewhat short on detail. Nevertheless it is still one of the best studies available, and is possibly the best evidence for the hypothesis that billboard distraction is situational (that is, it will not occur 'automatically' but only with certain signs at certain places, in certain situations) but real. Ady himself recognised that his study did not prove that billboards caused accidents but merely provided suggestive results for further investigation. Unfortunately follow up experiments were not carried out.

MADIGAN-HYLAND

7.16 The New York based agency Madigan-Hyland Inc. was commissioned to provide a report on billboards and their effects on advertising. This has proven to be one of the most controversial of all reports of its kind, and it is unfortunate that the report was never published, and was, therefore, unobtainable for this literature review. However, in 1963 the author of the report (Daniel Greenbaum) wrote a letter to the Chairman of the New York State Thruway Authority, which summarised its findings. This letter was placed in the Congressional Record. It is this letter that is used as the basis for the following description.

Method

7.17 Two years worth of data were analysed relating to the New York State Thruway (1961-1962). As with the other studies, observers were sent out to collate data relating to the exact locations of signs and other 'similar devices' that could, in theory, be seen by motorists. Accident records were obtained from the relevant police authority, and divided into two main groupings: accidents that occurred where the motorist could see these signs and accidents that occurred where the motorist could not see these signs.

7.18 It was felt simply to analyse all data would be too confusing and would create too large a database. Therefore all accidents were omitted except for accidents which were specifically classified as 'driver inattention' by the investigating state trooper. Rather remarkably, accidents at toll booths and interchanges were omitted from the study (despite the fact that they accounted for 25% of the accidents in the group), on the grounds that as other causal factors (such as 'the need to locate money for toll payment') were prevalent there and that this would therefore bias the study. Correlations were then calculated. It was discovered that 13.1% of the 1118 miles of highway had a high proportion of visible advertising, but 32.6% of the 1,550 accidents attributed to driver inattention occurred in these areas. Annually, 1.7 accidents occurred per mile at a 'high advertising' area, whereas only 0.5 accidents occurred per mile at a 'low advertising' area.

Used with permission of the author and the Scottish Government.

7.19 Traffic volume was controlled for by creating three separate sub-groupings of areas of high, medium and low-density traffic flow. Within these groupings, low and high advertising areas were correlated with accidents. In all three areas, high advertising areas had higher accident rates than low advertising areas (Neuberger, 1963).

Problems

7.20 The key problems with the Madigan-Hyland study are its concentration on 'driver inattention' reports only, and the degree to which it controlled for traffic volume. As has been stressed earlier, 'driver inattention' is merely a classificatory device, and its use will be context specific. Given that proponents for the existence of billboard distraction have argued that distraction may be unconscious (and that this argument has been backed up by Theeuwes, and Godjin, in press) it is not clear why drivers who were unconsciously distracted should state 'I was distracted' when asked why the accident happened. Moreover, despite the fact that traffic volume was controlled for, it was hardly controlled in a sophisticated (statistical) fashion. It was this methodology that led Blanche to describe their approach as 'erroneous' and 'immature' (!) (Champion, 1971: 134).

7.21 On the other hand, other studies (McMonagle 1952 a & b) have argued that intersections etc. should be correlated with specific distraction type events: specifically those involving search strategies. It could be argued that including these events could have increased the level of correlation.

7.22 Therefore, yet again, the Madigan-Hyland study provides a suggestive correlation, which should have been the basis for a long series of replicated scientific studies to investigate whether this was just a statistical 'fluke' or whether it indicated a genuine effect. However, to the best of our knowledge this was never carried out.

NEW JERSEY GARDEN STATE PARKWAY

7.23 This (1965) correlation study was carried out by Ernest Blanche on the New Jersey Garden State Parkway. Data related to accidents were collated for the years 1961, 1962 and 1963: producing 3902 accident reports in total. In order to carry out the research, official 'recorders' were sent out to list every off-road feature of the entire 173 mile parkway. This included 'bridges, overpasses…official signs of all kinds….advertising signs within 1300 feet of the parkway' (Blanche, 1965: 24). Therefore this was a study not just of billboards but of all roadside features.

7.24 To carry out the correlation study itself, a chart was drawn up dividing up the parkway into units of a tenth of a mile. On this chart every accident in the three-year timescale and every roadside feature was plotted. Traffic volume data was also provided. Then correlations between features and accidents were created, both individually and grouped together.

7.25 The study failed to find a correlation between advertising signs, safety signs, or any other roadside feature, and accident rates. It should be remembered that this was a correlation study and that even if a correlation effect had been found then this would not prove that billboards caused accidents, but would only suggest that more research was

Used with permission of the author and the Scottish Government.

needed. However the fact that no such effect was discovered is suggestive. Needless to say, the negative results have provoked criticism.

7.26 Wachtel and Netherton argue that because Blanche counted roadside signs up to 1300 feet from the parkway, any effect caused by specific signs close to the parkway would be 'swamped' by the extraneous 'noise' produced from the further away signs (Wachtel and Netherton, 1980). This may be true for the 'grouped' data, but Blanche makes it clear that individual variables were cross-correlated with accidents as well, such that this effect should not appear.

7.27 The fact that Blanche used all the accident data available in the relevant database and not just fatalities (as discussed above) is another problematic element of the research: also questionable is the fact that (unlike Holohan, below), no inter-rater reliability data was calculated as to the identification of roadside features. However the key point is that even if Blanche's findings are entirely justified they do not necessarily contradict those of Madigan-Hyland above. It is entirely possible that individual signs on specific roads in specific relationships to other signs may well have a negative impact on road safety although other signs do not. The Garden State Parkway is a multi-lane motorway, with a low number of highway deaths. However, (judging by the photographs provided, and its geographical location) it carries a high volume of traffic, and has an extremely high number of external roadside features. Therefore it would not seem to be the ideal place to test the theory that the genuinely dangerous situations are of low arousal, monotonous situations in which the position of a single, highly conspicuous sign on a seemingly safe area of road (for example a concealed sharp bend) can distract drivers and cause accidents.

INFORMAL, SMALL SCALE STUDIES

7.28 Champion (1971) carried out a brief survey of traffic in Melbourne, based on accident records provided by the Victorian Traffic Commission. He discovered that there was a negative correlation between accidents and billboards: however he failed to use controls, and the study used extremely small numbers.

McMONAGLE (MICHIGAN) STUDY

7.29 J.C. McMonagle carried out two studies in the 1940s. The first was a lab study, which will be discussed in the 'experimental' section below. The second, however, was a correlational study (McMonagle, 1952 a and b).

7.30 A 70 mile stretch of rural road was selected in Michigan. All road and roadside features were catalogued, and the road itself divided into 1000-foot sections. Local police agreed to record the distance of the accident from one of the 1000 foot markers in all accident reports. The study itself was carried out between 1946 and 1949. Two kinds of statistical analysis were performed on the data. First, accidents were classified according to their distance from each individual feature. Second, standard correlations were produced between the number of accidents and the number of various roadside features (in terms of feature density).

Used with permission of the author and the Scottish Government.

7.31 The results of the initial analysis demonstrated that intersections seemed to be an important feature in terms of accidents, and so the road was further divided into 'intersection' and 'non-intersection' areas. These analyses demonstrated that intersections are hazardous, with the accident rate on the sections of road classed as 'intersections' being double the rate for non-intersection sections of road. However McMonagle notes that intersections became even more dangerous when there were a large number of roadside features around them.

7.32 In terms of the correlation studies, roadside features were divided into six categories: 'Taverns', 'Gas Stations/Garages', 'Stores', 'Other Establishments', 'Design Features', and 'Advertising signs'. Correlations between these features and accidents were then studied. It was discovered that on their own these features had little effect, but when the same analyses were run with the road divided into 'intersections' and 'non-intersections' a correlation was discovered with Other Establishments, Advertising Signs, Taverns and Gas Stations. It should be noted, however, that these figures reflect amalgamations of numbers. That is, it seems to be the presence of intersections and *all four of the above categories* that lead to an increased rate of accidents.

7.33 Therefore more research was done to discover if there was a relationship between individual variables and accident rates (still on the 'intersection' area of road). When this was done it was discovered that only Gas Stations and Taverns were still associated with accidents, and that with Gas Stations the correlation was weak. Looking at the whole road, it was then found that the Taverns category had a link with accidents even on the 'non-intersection' of road.

7.34 The conclusion of the McMonagle study is simple: accidents are correlated with *road complexity.* As a general rule straight roads where traffic can flow reasonably easily (again, in general, higher traffic density is associated with higher accident rates, although the relationship is not linear) will be safer than congested roads with intersections, taverns and gas stations. Of course this might alter if the road becomes too straight, featureless and monotonous, leading to low arousal and 'highway hypnosis', and, hence the possibility of distraction from 'singletons'. Nevertheless the statement that 'road complexity is usually bad for road safety' is probably a worthwhile general heuristic. According to McMonagle it is unlikely that billboards, signs, and other roadside 'distracters' help directly to increase accident rates. Instead, systems features of the road itself are correlated with accidents.

7.35 There are two basic criticisms possible of the McMonagle study. Firstly, (and this point must be repeated), this is only a correlational study: McMonagle did not prove that road complexity causes accidents. Secondly, McMonagle did not present data as to whether his correlations were statistically significant or not.

HOLOHAN FIELD BASED ANALYSIS

7.36 The Holohan study was interesting in that it took account of the fact that signs are different. This was a specific study of signs, and not all roadside features, as with the Michigan and Minnesota studies. It also took into account the situational aspect of sign placement and its relationship to accidents. It should be noted that the experiments that were performed by Holohan (described below) dealt with situations where important safety signs were difficult to recognise when surrounded by other signs. This should be borne in mind when discussing his results (Holohan, 1979).

Used with permission of the author and the Scottish Government.

Methodology

7.37 Sixty intersections that had had at least one accident in 1975 were selected in Austin, Texas. Junctions with very high or very low traffic flow were eliminated from the study, and steps were taken to ensure the intersections were all roughly of the same type (that is, they were all streets intersected by other streets at a roughly 90 degree angle). Intersections were also divided into 'traffic lights' and 'stop signs' junctions.

7.38 Signs were categorised into size, kind of sign (public or private) and colour. Then police reports of studies were taken (using all the available evidence (direction of vehicle, probably cause, and responsible party). Alcohol and speeding related accidents were eliminated (as were accidents occurring at night, it being assumed that signs could not distract if they could not be seen).

7.39 Observers were sent out 'into the field' and categorised every sign visible from these intersections on the three dimensions above. Inter-rater reliability data was produced to ensure that all the signs were correctly logged. Then correlations were calculated between intersections which had low or high accident rates, and the various sign variables discussed above.

7.40 It was discovered that whereas traffic signal approaches showed no correlations, at stop sign intersections there was a link between accidents and the presence of a number of signs, large signs, and colour (specifically, non-red signs). However, Holohan argued that this effect was possibly the result of rates of traffic flow, and that the data would have to be re-analysed to take this into account. This did reduce the level of correlation. However, there was still a link between number of signs, non red-signs, private signs and (particularly) large signs and the accident rate at stop sign junctions.

7.41 The conclusions Holohan drew were as follows: that in a situation of visual search, drivers could be distracted by extraneous phenomena which were of the same medium as the searched for object. That is, at traffic lights it was reasonably easy to spot the lights, but in a situation where there were a large number of signs, the driver would be slowed down in terms of making the visual search, and an accident could occur in this 'gap' period. This supports the research quoted in section 3.29 above: visual search was slowed down when there were irrelevant stimuli available when subjects did not know what they were looking for. This would be the case here: drivers would not necessarily know that a stop sign was at the intersection (that is, who had right of way) and would be searching to see if one was present. This search was slowed by a large number of commercial, large signs.

7.42 Again, we should be careful of reading too much into a correlational study. However, Holohan's research is backed up by current research, and bears out Blanche's point above. It begins to look as though the question 'do billboards cause accidents?' is meaningless. However it may be possible to ask and answer the question 'will this sign, in this situation, at this time, tend to lead to a higher accident rate?'

Used with permission of the author and the Scottish Government.

OREGON STATE HIGHWAY

7.43 Whilst not being strictly a distraction study, the Oregon State Highway Study nevertheless shows some details as to 'systems' features of traffic accidents that help to explain traffic accident rates (Head, 1959).

Methodology

7.44 Observers collated data on 426 'sections' of a highway in Oregon. Roadside features were noted and divided into seven sections of which two are of particular importance in terms of the current study: traffic signals and shops ('commercial units'). Accident data were obtained from the Oregon State Highway Department for the years 1954 and 1955. Traffic flow data were obtained, and the number of accidents per million vehicle miles was calculated to allow for traffic volume. Correlations were then obtained.

Results

7.45 Head discovered (as with Holohan above op cit.) that the number of intersections per mile correlated with accident rates (note: this relation is at its strongest when traffic volume is high and gradually fades away as traffic volumes drop). Also he discovered that intersections with traffic lights were correlated strongly with accident rates. Other correlations of interest were that between 'indicated speed' and accident rates (this time a negative correlation: the lower the speed the higher the accident rate). However the strongest and most important of all correlations was that between Commercial Units and accident rates. Average daily traffic was correlated with accident rates but the relationship was not linear (it tended to become stronger as volume increased).

7.46 The results of Head's study demonstrate some facts that are intuitively obvious but are sometimes forgotten in correlation studies. They support Holohan's study (above): complex driving situations tend to be more associated with accident rates than simple driving situations. That is, roads with high traffic volume, many intersections, many shops, and many traffic lights will tend to produce more accidents than roads where the opposite is the case. The key point is that billboards, advertising signs, adverts on taxis and so forth tend to be situated in these areas (in fact, most shops prominently display signs advertising themselves, thereby creating a confound: it would be difficult to tell whether any statistical effect was caused by the sign or by the shop). Yet again, even if a correlation between signs/adverts etc. and accidents was demonstrated, this would not prove causation.

MINNESOTA RURAL TRUNK HIGHWAY

7.47 Another correlation study was the Minnesota Rural Trunk Highway study, which was carried out in 1951. 510 miles of Minnesota (mainly rural) highway were selected and divided into 2,600 road sections. Each section was then studied by observers, and every relevant off-road feature was noted and entered into a database (the report does not go into detail as to how this was done, nor whether inter-rater reliability was calculated). Correlations were then calculated.

Used with permission of the author and the Scottish Government.

7.48 The major conclusion of the report as a whole supports the theories of Head. That is, high speed, low-to-medium traffic volume, low complexity (i.e. few intersections) roads are generally safer than the contrary.

7.49 There are two major findings of the Minnesota study which are of interest here. The first is (as mentioned earlier) accident rates for curves which were preceded by a long stretch of road are higher than those which were preceded by a short stretch of road. This lends support to the idea that low arousal leads to lowered attention, and that when a curve occurs, drivers are less prepared to cope with it. It should also bring to mind Ady's study of the advertising sign located on a curve which was strongly associated with accidents.

7.50 The second major finding relates to advertising signs and commercial units. In terms of commercial units, sections of road within 300 feet of a commercial unit were selected for analysis. Traffic volume was controlled for. It was discovered that accident rates for the road sections close to commercial units was considerably higher than that for the control section.

7.51 Advertising signs were observed and the data collated. It was found that 95.6% of the signs were within 60 feet of the roadway centre line, and 51.4% larger than 12 square feet. The signs were of various shapes and sizes (e.g. diamonds, horizontally rectangular, oval), and were mainly coloured red, yellow, black, white, and blue. However only 5.8% of them were neon or illuminated in some other way. The study noted that 14% of the signs were located on commercial units advertising the produce, but did not go on to state whether other signs were located on commercial units. Again, here is a potential confound: commercial units tend to imply intersections (where drivers can get back onto the freeway) but also advertising signs.

7.52 Traffic accident data were then calculated and compared with road sections with data pertaining to frequency of signs per mile. Traffic volume data was also calculated for the same sections of road. The tests were significant, indicating a positive link between number of signs and number of accidents.

7.53 More data were then calculated to see whether the presence of signs at intersections had a statistically significant relation to accidents. Again the results were positive (Staffeld, 1953).

THE RUSCH STUDY

7.54 In 1951 W.A. Rusch published the results of the Iowa study into the safety effects of billboards. Again it was a correlation study, so the 'correlation does not imply causation' rule applies. It should also be noted that there are issues of ecological validity: as Rush states, Iowa was (and is) more rural and less 'developed' in terms of business than New York or Los Angeles. However, to counteract this, unlike most of the studies above, this analysis concentrated on cities/towns with a population of over 5,000 (Rusch, 1951).

Used with permission of the author and the Scottish Government.

Methodology

7.55 The State of Iowa was divided into four geographical areas, and classed according to population. Within each area, subgroups were created called A-B, X and Y areas. A-B areas were areas of a mile or half mile in length where at least 90% of the advertising and roadside business being studied were situated. The X areas were a mile beyond the 'A-B' group, and the Y areas were one mile beyond the X area (these were therefore the same 'kind' of road, but had less advertising). There were few differences in traffic volume between the A-B, X, and Y areas, with rates averaging at between 2,500 and 4,000 vehicles per day. All roads (with a few minor exceptions) were two lane.

7.56 Accident records were obtained from the Iowa State Highway Commission for 1947 and 1948. Accidents were divided into three main groups on the basis of these reports: accidents attributed to roadside businesses, accidents attributed to attentional problems, and accidents attributed to 'other' causes. Obviously 'raw' figures of total accident rates were created as well.

Analysis and Results

7.57 It was discovered that the greatest number of accidents for each year occurred in the A-B area. Moreover, accidents associated with attentional problems were particularly associated with the A-B group. This was the case in both years in which the study took place. In terms of 'adjusted' accidents per 100 miles the same basic patterns occurred. Rusch concluded that inattention accidents were associated with areas where advertising and businesses were more prevalent.

Discussion

7.58 Again, Rusch's study was suggestive. However it has two major difficulties. Firstly it is not clear from the published data how 'areas rich in advertising and businesses' were identified. The second major problem is the 'correlation does not imply causation' rule. Of course, this applies to all the correlation studies. However in Rusch's the problem is particularly acute in that advertising and business location data was collated, not separated. It is clear from other studies that business location (and what comes with business location: heavier traffic, slower speeds, more intersections) is associated with higher accident rates. It is not clear in Rusch's paper how these confounding factors were controlled for, if at all. It may well be, therefore, that the effects noted were simply effects caused by road/systems factors.

VERSACE

7.59 The Versace study of 1960 was a study of two lane rural highways in Oregon. 1,400 miles of the Oregon highway system were selected, and fourteen categories created including average daily traffic, land-width, and number of structures. Versace does not make clear how these elements were selected or created. A factor analysis was then carried out to identify the relationship of these elements to accidents.

Used with permission of the author and the Scottish Government.

7.60 Versace's discoveries were similar to the other studies above, in that what he terms 'traffic conflict' (a mixture of traffic volume, number of driveways and number of intersections) was most strongly associated with accidents. He failed to find significant correlations with many other features and none of relevance to this study.

7.61 The problems with Versace's study are the usual ones. It is not clear where he obtained his data, how he calculated numbers of 'roadside structures', or whether advertising signs/billboards/other signs were included as a 'roadside structure'. Given these problems, the relevance of his study to the current research is limited (Versace, 1960).

Summary

7.62 There are numerous statistical studies of the relationship between billboards and accident rates. Almost all of them are correlational and therefore cannot prove causation. Nevertheless some studies (especially the Ady 'before and after' study) seem to demonstrate a relationship between accidents and billboards in some circumstances.

EXPERIMENTAL STUDIES

7.63 As well as these mainly correlational studies (with the exception of Ady), there have also been two major experimental studies. Here the main problem is 'ecological validity': that is, how accurately the experimental set up reproduces 'real world' driving situations.

JOHNSTON AND COLE

7.64 It should be noted that both the Holohan and Johnston/Cole studies used young (early late 'teens/early 'twenties) psychology students as subjects. This is not representative of the average driving population. Moreover, whereas the field studies above tended to study rural areas, it must be assumed that the majority of these students were white, middle class, and had a shared cultural background. This, again, creates a problem with ecological validity.

7.65 Johnston and Cole carried out a study in the mid 1970s to see whether irrelevant information could distract subjects from driving-like tasks (Johnston and Cole, 1976).

Method

7.66 Subjects were placed before a curved white screen, on which photographs could be projected. Subjects were equipped with a joystick for task performance. Arrows pointing right or left appeared on the screen at various intervals (infrequently to measure 'leisurely driving'; more frequently to mimic 'demanding driving'). The task was for the subject to move the joystick in the direction indicated by the arrow. At the same time coloured adverts and signs (of the sort frequently found on billboards) were broadcast on the screen. Subjects attempted to carry out the task while 240 of these were projected randomly on the screen. In some experiments as well as these images, a small 'spot' target would appear at two random locations occasionally throughout the experiment. The subject was to press a button held in his/her left hand whenever they were seen. The tests were to correctly move the joystick in

Used with permission of the author and the Scottish Government.

the direction indicated, and to spot the 'target' as quickly as possible, despite the possibly distracting effects of the adverts and images. Five experiments were conducted in total, investigating various effects of the distraction and task performance.

Results

7.67 In terms of the main task (the arrow task) it is clear that there were two parameters: task performance and task time. That is, how accurately subjects moved the joystick in the indicated direction, and how quickly they 'spotted' the arrows. The second, 'target' task, obviously had only the second parameter. In two of the experiments, there was a decrease in accuracy on the 'arrow' task, and in three others there was an increase in detection times (in both situations when distracters were present (only one of these experiments showed both effects at the same time)). Interestingly, in two experiments, accuracy increased under conditions of distraction: Johnston and Cole interpreted this as evidence for Hebb's 'arousal' theory: that is, in a boring experiment colour adverts helped maintain arousal and increase task performance. However, there seemed to be a concommitant increase in detection time of the target (when present) in this situation (that is, when searching the visual field for important information).

Conclusions

7.68 Johnston and Cole explicitly took Hebb's theory as the model for their experiment, and, as they stated themselves, failed to consider Broadbent's 'filter' theory or to test for it. Nevertheless they did discover an effect that bears out Hebb's arousal theory of distraction, in both senses: that information can increase or decrease task performance depending on circumstance. The main problem with their experiment (apart from ecological validity: this was not sufficiently close to a real-life car situation to prove that the same effect would occur on the road) was that the effects (though statistically significant) were small. On the other hand, this would explain why there seems to be a statistical link between billboards and accidents and yet why this contributory factor rarely turns up in accident databases. It should be noted that Johnston and Cole's experiment only took account of average scores: it is possible that some individual adverts may have had a far more distracting effect than others.

HOLOHAN

7.69 The other major study in this field is the Holohan experiments (a companion to Holohan's field studies, above) (Holohan et al, 1978).

Method

7.70 56 psychology students were asked to sit in front of a visual display on which slides were projected by a computer, which also measured reaction times of subjects. Each subject was presented with 106 slides, some of which (but not all) showed a normal traffic 'stop' sign (white lettering on red background). When this was seen, subjects were to press a 'target present' button wired up to the computer as quickly as possible. When the target was missing

Used with permission of the author and the Scottish Government.

the subjects were to press a 'target missing' button. The experimental effect was to be provided by the distracters that were also shown on the same slide.

7.71 Distraction effects were grouped along three main categories: number, colour and location. The 'stop' sign would be surrounded by either 2,4,6, or 10 distracters (4.45 cm. square elements containing common words mimicking commercial signs) which were classified by similarity of background colour. That is, they were either identical to the 'stop' sign (red), similar (orange) or dissimilar (blue green or black). Distracters were also either close or far away from the 'stop' sign. Therefore, there was a total of 48 different combinations of these variables to test.

Results

7.72 The results were positive for the tested hypothesis. That is, search times were slowed by a larger number of distracters, which were similar to or identical to the target sign in terms of colour, and close to the target. The deciding factor seems to have been proximity: all distracters close to the target slowed reaction time. However, number of distracters and colour (that is, the larger the number of distracters and the closer in colour they were to the target the stronger the effect) also produced a strong effect, when the distracters were further away. That is, regardless of any other variable, proximal distracters *always* slowed reaction time. It was only when this was controlled for that other factors came into play.

Problems

7.73 The key point again is ecological validity. Without belabouring the point, it must be asked how similar searching for a target sign on a two dimensional screen is to actual driving tasks. Moreover, subjects were given a maximum time of 1.5 seconds per slide to identify the target: given that searching for a 'stop' sign would normally be at an intersection, it is possible that drivers in real world situations would have slightly more time (perhaps three or four seconds) to look for any relevant sign. Thus, the effect, though real, might not manifest itself in the 'real world'. On the other hand, this bears out McMonagle's finding about the effect of distracters on junctions and intersections.

Summary

7.74 Experimental studies suggest that billboards and signs can function as distracters, but due to considerations of ecological validity, this conclusion should be treated with caution.

CONCLUSIONS

7.75 It is likely that there is more than one kind of 'distraction'. We suggest there are two main features of external-to-vehicle driver distraction.

7.76 Firstly, 'search mode' distraction. The scientific evidence seems overwhelming that in a situation where the driver does not know what s/he is looking for (in other words, s/he is unsure whether a 'stop' sign, for example, exists or not) the existence of 'distracters' in the

Used with permission of the author and the Scottish Government.

area in which s/he is looking, will slow up the search. This kind of distraction is particularly associated with junctions.

7.77 Secondly 'broad attention' distraction. This is in a situation where the driver does not realise there is a threat, and is not looking for anything in particular. Ironically enough s/he is now particularly at risk from distraction. This mode is particularly prevalent on motorways, and highways. Of course, mostly when the driver feels that s/he is not at risk, there is in fact no risk. The danger comes when the situation changes without the driver realising it. This would be the case on a sharp bend at the end of a long featureless section of road, and it is significant that the 'distracting' billboard in the Ady study was in just such a place.

7.78 A subdivision of this would be 'phototaxis' in which the driver is distracted from the road by the flashing lights of a stationary vehicle or billboard. This would be a case of 'absorption' and it is possible that accidents caused by drivers becoming 'engrossed' or 'absorbed' in a mobile telephone conversation are also of this sort. The 'Catch-22' of attention studies is that in some circumstances signs (or other sources of information) may help the driver maintain his/her alertness. It is vital to know when signs might help the driver and when they might distract him/her, but there has been little or no research on this issue.

7.79 The evidence suggests that 'abrupt onsets', primary colours, bright lights, and 'volume of information' are important in attracting attention. Therefore, flashing neon signs, information-rich signs (with moving images for example), sexually or otherwise explicit signs, would be particularly likely to attract attention from the road. It is likely that these strictures are particularly apposite regarding 'search' mode distraction at junctions. Here, high information and 'novel' signs would slow down search patterns even more by increasing visual 'clutter' and hence would lessen further the time available for the driver to make decisions.

7.80 Despite this, it is still not proven whether billboards attract attention from driving or not. Certainly there is a large amount of scientific evidence suggesting they might under certain circumstances, and a few suggestive correlation and laboratory studies suggesting they do. However all the studies are flawed: either because they are correlation studies, because they are too small scale to draw conclusions from, or because of issues of ecological validity.

7.81 With signs becoming increasingly prevalent and increasingly explicit, it is vital that research is done on this topic, and genuine scientific evidence produced to guide planners and local authorities in terms of policies and procedures for sign placement.

Used with permission of the author and the Scottish Government.

CONCLUSIONS

8.1 There is an extremely large body of empirical data concerning distraction. The general consensus of this body of research is that distraction can take place, even when the driver is concentrating on the task ahead of him/her.

8.2 There is also abundant evidence that billboards and signs can function as distractors. Scientific studies of perception have shown that in situations where subjects are attempting to identify objects on a computer screen, their search can be slowed down with the presence of visual distracters. There is statistical and laboratory evidence that this effect occurs in 'real world' situations and that this is most likely to happen at junctions, or other 'cluttered' visual environments.

8.3 There is also evidence of billboards and signs functioning as distractors in 'low information' situations. This is a situation of 'underarousal' where the driver stops paying attention to the road in front of him/her, and is, therefore particularly prone to distraction by extraneous features. There is also statistical evidence that this represents a 'real world' effect. However, this area is under-researched, and further details are lacking in the literature.

8.4 It is likely that external-to-vehicle distraction is under-represented in the standard accident databases (for example, FARS, and NASS in the United States). It is questionable whether drivers would spontaneously volunteer information that may have deleterious legal consequences for them. Moreover, some distraction effects may function 'unconsciously': therefore, their existence could only be demonstrated by statistical methods, or in the laboratory.

8.5 The vast majority of data pertaining to billboards/signs and their relation to driver distraction is either old (much of it over twenty years old) and/or biased towards the United States and Australia. There is little published research available (in English) relating to the European driver environment, less on the UK, and nothing on particularly Scottish issues. Given the increasing complexity of the driving environment, and the increasingly 'eye catching' and 'explicit' nature of contemporary advertising, it is important that research is carried out such that the relevance of this research to a British/Scottish environment can be demonstrated.

8.6 It is suggested that the effect of visual 'clutter' at junctions has been sufficiently well established that specific guidelines relating to this issue could be created to regulate the position and number of advertisements in this context. However, more research is needed to establish what kind of advertisement/sign is most likely to contribute to accidents, and what level of effect specific advertisements are likely to have.

8.7 The issue of distraction by cognitive 'underload' is more controversial. It is suggested, therefore, that research is carried out to demonstrate that such an effect exists and that, if it does, what level of threat it poses to the driving environment. This is particularly important not just because of the increasing number of advertisements in the driving environment, but also because of the placing of large 'public art' monuments by the side of motorways: exactly the place where this kind of object would function most efficiently as a distracter. Of course it may be that 'public art' of this sort functions as a way of adding

Used with permission of the author and the Scottish Government.

information to the visual scene such that arousal levels are raised, and drivers are 'kept alert'. Only further research can answer this important question.

8.8 Despite the fact that in its totality the evidence for driver distraction by billboards is compelling, individual studies have been criticised on methodological grounds. It is likely that greater emphasis on experimental 'controls' (and less emphasis on purely correlational studies) would go a long way towards answering these criticisms. Moreover, in terms of laboratory studies, far more realistic electronic representations of the driving experience are possible now than in the 1970s (when most of the laboratory studies took place). Psychological (and statistical) theory has also moved forward, enabling more sophisticated research questions and more complex analysis of data to be performed. Therefore, with both forms of distraction more research using contemporary methods is required.

Used with permission of the author and the Scottish Government.

ANNEX ONE REFERENCES

Abdel-Aty, M (2002) *Distracted Driver Safety,* North Carolina: North Carolina Highway Safety Research Center

Ady, R (1967) 'An Investigation of the Relationship between Illuminated Advertising Signs and Expressway Accidents', *Traffic Safety Research Review,* Vol. 3, pp9-11

Allport, A (1993) 'Attention and Control: Have we been asking the wrong questions? A Critical Review of Twenty Five Years', in Meyer and Kornblum (eds) *Attention and Performance XIV*, London and Cambridge, Mass : MIT Press

Alm, H, and Nilsson, L (1995) 'The Effects of a Mobile Telephone Task on Driver Behaviour in a Car Following Situation', *Accident Analysis and Prevention*, Vol. 27, No. 5, pp707-715

Anonymous (1974) 'Do Billboards Cause Highway Accidents?', *The Accident Reporter*, February: p1

Arthur, W, Barrett , G, Doverspike, D, (1990) 'Validation of an Information-Processing –Based Test Batter for the Prediction of Handling Accidents Among Petroleum-Product Transport Drivers', *Journal of Applied Psychology*, Vol. 75, No. 6, pp621-628

Avolio, B, Kroeck, K, and Panek, P, (1985) 'Individual Differences in Information-Processing Ability as a Predictor of Motor Vehicle Accidents', *Human Factors*, Vol. 27, No. 5, pp577-587

Bacon, W, and Egeth, H (1994) 'Overriding Stimulus Driven Attentional Capture', *Perception and Psychophysics,* Vol. 55, No. 5, pp485-496

Bahcall, D, and Kowler, E (1999) 'Attentional Interference at Small Spatial Separations', *Vision Research*, Vol. 39, pp71-86

Berkhout, J (1979) 'Information Transfer Characteristics of Moving Light Signals', *Human Factors*, Vol. 21, No. 4, pp445-455

Berlyne, D E (1957) 'Conflict and Information-Theory Variables as Determinants of Human Perceptual Curiosity', *Journal of Experimental Psychology*, Vol. 64, pp399-404

Berlyne, D E (1960) *Conflict, Arousal and Curiosity,* New York: McGraw-Hill

Berlyne, D E (1970) 'Novelty, Complexity and Hedonic Value', *Perception and Psychophysics*, Vol. 8, No. 5A, pp279-286

Bhise, V, and Rockwell, T (1973) 'Toward the Development of a Methdology for Evaluating Highway Signs Based on Driver Information Acquisition', *Highway Research Record*, Vol. 440, pp38-56

Used with permission of the author and the Scottish Government.

Biederman, I (1972) 'Perceiving Real-World Scenes', *Science*, Vol. 177, No. 4043, pp77-80

Blanche, E, (1965) 'The Roadside Distraction', *Traffic Safety*, 10, 24-37

Boadle, J (1976) 'Vigilance and Simulated Night Driving', *Ergonomics,* Vol.19, No. 2, pp217-225

Bowditch, S (2001*) Driver Distraction: A Replication and Extension of Brown Tickner and Simmons (1969)*, London: Department of Transport. Available online http://www roads dft gov uk/roadsafety/behaviour/12 htm

Broadbent, D (1958) *Perception and Communication*, New York: Pergamon Press

Brouwer, W, Waterink, W, van Wolffelaar, P, and Rothengatter, T (1991) 'Divided Attention in Experienced Young and Older Drivers: Lane Tracking and Visual Analysis in a Dynamic Driving Simulator', *Human Factors*, Vol. 33, No. 5, pp573-582

Brown, B, and Cole, B (1969) 'The Effect of Visual Noise on the Recognition of Road Traffic Signal Lights', *Australian Road Research*, Vol. 4,No. 1, pp35-49

Brown, I (1991) 'Highway Hypnosis: Implications for Road Traffic Researchers and Practitioners', in Gale, AG (ed) *Vision in Vehicles III*, North Holland: Elsevier

Brown, I (2001) *A Review of the 'Looked But Failed To See', Accident Causation Factor*, London: Department of Transport. Available online http://www roads dft gov uk/roadsafety/behaviour/13 htm

Brown, B, and Monk, T, (1975) 'The Effect of Local Target Surround and Whole Background Constraint on Visual Search Times', *Human Factors,* Vol. 17, No. 1, pp81-88

Brown, I, and Poulton, E (1961) 'Measuring the Spare "Mental Capacity" of Car Drivers by a Subsidiary Task', *Ergonomics*, Vol. 4, pp35-40

Brown, I , Tickner, A and Simmonds, D (1969) ',Interference between concurrent tasks of driving and telephoning', *Journal of Applied Psychology,* Vol. 53, No. 5, pp419-424

Burg, A (1971) 'Vision and Driving: A Report on Research', *Human Factors*, Vol. 31, No. 1, pp79-87

Burns, P, and Lansdown, T (2000, July - August) 'E-Distraction: the challenges for safe and usable internet services in vehicles', *Internet Forum on the Safety Impact of Driver Distraction When Using In-Vehicle Technologies.* Available Online http://www driverdistraction org

Casimir, J, Ludwig, H, and Gilchrist, I (2002) 'Stimulus-Driven and Goal-Driven Control over Visual Selection', *Journal of Experimental Psychology: Human Perception and Performance* Vol. 28, No. 4, pp902-912

Used with permission of the author and the Scottish Government.

Castiello, U (1998) 'Attentional Coding for Three-Dimensional Objects and Two-Dimensional Shapes: Differential Interference Affects', *Experimental Brain Research*, Vol. 123, pp289-297

Champion, C, (1971) 'Illuminated Advertising Signs, Their Effect on Traffic and the Environment', *IES Lighting Review*, Vol. 10, pp131-135

Chapman, P, King, S and Underwood, G (2001) 'The Role of Experience in Searching Road Scenes', London: Department of Transport Available online: http://www roads dft gov uk/roadsafety/behaviour/19 htm

Chapman, P and Underwood, G (1998) 'Visual Search of Driving Situations: Danger and Experience', *Perception,* Vol. 27, pp951-964

Chapman, P, Ismail, R, Avellano, T, and Underwood, G (in press) 'Time-gaps while driving', To appear in Grayson GB (ed), *Behavioural Research in Road Safety 9* Crowthorne: Transport Research Laboratory

Chapman, P, Ismail, R and Underwood, G (in press) 'Waking up at the wheel: Accidents, attention and the time-gap experience', To appear in Gale AG et al (eds) *Vision in Vehicles 7,* Amsterdam: Elsevier

Charles, M, Crank, J, and Falcone, D, (1990) *A Search for Evidence of the Fascination Phenomenon in Road Side Accidents*, Washington DC: AAA Foundation for Traffic Safety

Chau, A and Yeh, Y (1995) 'Segregation by Colour and Stereoscopic Depth in Three Dimensional Visual Space', *Perception and Psychophysics*, Vol. 57, No. 7, pp1032-1044

Clarke, D, Ward, P, Truman, W (2001) *In Depth Accident Causation Study of Young Drivers* London: Department of Transport. Available online http://www trl co uk/1024/mainpage asp?page=140

Claret, P, Castillo, J, Moleon, J, Cavanillas, A, Martin, M and Vargas, R (in press), 'Age and sex differences in the risk of causing vehicle collisions in Spain, 1990 to 1999', *Accident Analysis and Prevention,* No. 838 (2002) pp1–12

Coetze, J (2003) 'The Evaluation of Content on Outdoor Advertisments', Unpublished Note Available online
http://www its-traffic co za/publications/SANRAL%20face%20evaluation%20presentation pdf

Cole, G, and Hughes, P (1984) 'Field Trial of Attention and Search Conspicuity', *Human Factors*, Vol. 26, No. 3, pp299-313

Cole, G, and Hughes, P (1990) 'Drivers Don't Search: They Just Notice', In Brogan, D (ed) *Visual Search Procedures, Ist International Conference on Visual Search, University of Durham, September 1988*, London: Taylor and Francis.

Cole, B and Jenkins, S. (1980) 'The Nature and Measurement of Conspicuity', *Proceedings of the 10th Conference of the Australian Road Research Board,* Vol. 10, Part 4, pp99-107.

Used with permission of the author and the Scottish Government.

Cole, B and Jenkins, S (1984) 'The Effect of Variability of Background Elements on the Conspicuity of Objects', *Vision Research*, Vol. 24, No. 3, pp26-270

Cooper, P, Zheng, Y (2002) 'Turning Gap Acceptance Decision Making: The Impact of Driver Distraction', *Journal of Safety Research*, Vol. 33, pp321-335

Croft, P, and Nix-James, D, (1977) *Roadside Advertising and Traffic Crashes: A Review: TARU Research Note, RN 5/77*, New South Wales: Traffic Accident Research Unit

Crundall, D, Underwood, G, and Chapman, P (1999) 'Driving Experience and the Functional Field of View', *Perception*, Vol. 28, pp1075-1087

Curry, D (2002) 'In-Vehicle Cell Phones: Fatal Distraction?', *Professional Safety*, Vol. 47, No. 3, pp28-33

Denny, M (1957) 'Learning Through Stimulus Satiation', *Journal of Experimental Psychology*, Vol. 54, pp62-64

Department of Transport, (1982) *Traffic Signs Manual*, London: Department of Transport

Department of Transport (1998) *Transport Statistics: Young Car Drivers in Road Accidents: Great Britain 1998*. Available online http://www transtat dft gov uk/facts/accident/young/young98 htm

Department of Transport (2001) *Road Geometry: Vol 6,* London: Department of Transport

Department of Tranpsport (2003) *Older Drivers: A Review, Road Safety Research Report No. 25.* Available online: http://www roads dft gov uk/roadsafety/research25/10 htm

Duncan, J, Williams, P, Nimmo-Smith, I and Brown, I (1993) 'The Control of Skilled Behaviour: Learning, Intelligence and Distraction', in Meyer, D, and Kornblum, S (eds) *Attention and Performance XIV*, London and Cambridge, Mass : MIT Press

Edkins, G and Pollock, C (1997) 'The Influence of Sustained Attention on Railway Accidents', *Accident Analysis and Prevention*, Vol. 29, No. 4, pp533-539

Folk, C, Remington, R and Johnston, J (1992) 'Involuntary Covert Orienting is Contingent on Attentional Control Settings', *Journal of Experimental Psychology: Human Perception and Performance*, Vol. 18,No. 4, pp1030-1044

Eost, C and Flyte, M (1998) 'An Investigation into the use of the car as a mobile office', *Applied Ergonomics*, Vol. 29, No. 5, pp383-388

Evans, L (1991) *Traffic Safety and the Driver*, New York: van Nostrand Reinhold

Evans, D, Ginsburg, A, (1985) 'Contrast Sensitivity Predicts Age-Related Differences in Highway Sign Discriminability', *Human Factors*, Vol. 27, No. 6, pp637-642

Used with permission of the author and the Scottish Government.

Federal Highway, Administration (2001) *Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction: Report FHWA-RD-01-071,* Available online http://www fhwa dot gov/realestate/elecbbrd/elecbbrd pdf

Finlay, D, Wilkinson, J (1984) 'The Effects of Glare on the Contrast Sensitivity Function', *Human Factors*, Vol. 26, No. 3, pp283-287

Fockert, J, Rees, G, Frith, C, and Lavie, N (2001) 'The Role of Working Memory in Visual Selective Attention', *Science*, Vol. 291, pp1803-1806

Forbes, T, Fry, J, Joyce, R, and Pain, R (1968) 'Letter and Sign Contrast, Brightness, and Size Effects on Visibility', *Highway Research Record*, Vol. 216, pp48-54

Forbes, T, Pain, R, Joyce, R, Fry, J (1968) 'Colour and Brightness Factors in Simulate and Full-Scale Traffic Sign Visibility', *Highway Research Record*, Vol. 216, pp53-65

Friedman, A (1979) 'Framing pictures: The Role of Knowledge in Automatized Encoding and Memory for Gist ' *Journal of Experimental Psychology: General*, Vol. 108, No. 3, pp316-355

George Mason University (2002) 'Distracted Driving: Review of Current Needs, Efforts and Recommended Strategies', Available online: http://www caph gmu edu/DDFinalReport pdf

Giambra, L (1995) 'A Laboratory Method for Investigating Influences on Switching Attention to Task-Unrelated Imagery and Thought', Consciousness and Cognition, 4, 1-21

Gibson, B, Jiang, Y (2001) 'Visual Marking and the Perception of Salience in Visual Search', *Perception and Psychophysics*, Vol. 63, No. 1, pp59-73

Gibson, J (1979) *The Ecological Approach to Visual Perception*, Boston: Houghton Mifflin

Goodman, M, Bents, F, Tijerina, L, Wierville, W, Lerner, N and Benel, D (1997) 'An Investigation of the Safety Implications of Wireless Communications in Vehicles', NHTSA Available online: http://www nhtsa dot gov/people/injury/research/wireless/#toc

Gopher, D (1982) 'A Selective Attention Test as a Predictor of Success in Flight Training', *Human Factors,* Vol. 24, No. 2, pp173-183

Gopher, D (1993) 'The Skill of Attention Control: Acquisition and Execution of Attention Strategies', in Meyer, D, and Kornblum, S, (eds) *Attention and Performance XIV*, London and Cambridge, Mass : MIT Press

Green, M, (2001) 'Adequacy of the Evidence', *Risk Management*, Vol. 48, No. 11, pp40-48

Green, M and Low, D (2001) 'Warning! Safety Signs may be Ineffective!', *OHS Canada*, October/November

Green, S (1987) *Physiological Psychology*, London: Routledge and Kegan Paul.

Used with permission of the author and the Scottish Government.

Guerrier, J, Mannivannan, P, Nair, S (1999) 'The Role of Working Memory, Field Dependence, Visual Search, and Reaction Time in the Left Hand Turn Performance of the Older Female Driver', *Applied Ergonomics*, Vol. 30, pp109-119

Haigney, D, Taylor, R (1998) 'Mobile Phone Use whilst Driving: Phone Operation Vs Vehicle Transmission', RoSPA. Available online: http://www rospa org uk/cms/STORE/Road%20Safety/studies files/studies htm

Hakamies-Blomqvist, L, and Peters, B (2000) 'Recent European Research on Older Drivers', *Accident Analysis and Research,* Vol. 32, pp601-607

Häkinnen, S (1979) 'Traffic Accidents and Professional Driver Characteristics: A Follow Up Study', *Accident Analysis and Prevention*, Vol. 11, 7-18

Harbluk, Noy, Y, Eizenman, M (2002) 'The Impact of Cognitive Distraction on Driver Visual Behaviour and Vehicle Control', Transport Canada Available online: http://www tc gc ca/roadsafety/tp/tp13889/pdf/tp13889es pdf

Harbluk, J, Noy, Y, Eizenmann, M (2000) 'The Impact of Internal Distraction on Driver Visual Behaviour', unpublished note. Available online http://www-nrd nhtsa dot gov/departments/nrd-13/driver-distraction/PDF/1 PDF

Head, J (1959) 'Predicting Traffic Accidents from Roadway Elements on Urban Exensions of State Highways', *Highway Research Board Bulletin*, Vol. 208, pp45-63

Hebb, D (1955) 'Drives And The C N S (Conceptual Nervous System)', *Psychological Review,* Vol. 62, 243-254

Hendricks, D, Fell, J, Freedman, M (2001) *The Relative Frequency of Unsafe Driving Acts in Serious Traffic Crashes,* NHTSA: Washington DC

Highway Planning Survey, Minnesota Department of Highways (1951) *Minnesota Rural Trunk Highway: Accident, Access Point and Advertising Sign Study,* Minnesota: Minnesota Dept of Highways in association with US Department of Commerce

Hirst, W, Spelke, E, Reaves, C, Caharack, G, Neisser, U (1980) 'Dividing Attention without Alternation or Automaticity', *Journal of Experimental Psychology (General)* Vol. 109, No. 1, pp98-117

Holohan, C, (1979) *Psychological Analysis of Degree of Safety in Traffic Environment Design*, Council for Advanced Transportation Studies, Texas

Holohan, C, Culler, R, Wilcox, B (1978) 'Effects of Visual Distraction on Reaction Time in a Simulated Traffic Environment', *Human Factors*, Vol. 20, No. 4, pp409-413

Huga, S (1984) 'An Experimental Study of Signal Vigilance Errors in Train Driving', Ergonomics, Vol. 27,No. 7, pp755-765

Hughes, P and Cole, B (1984) 'Search and Attention Conspicuity of Road Traffic Control Devices', *Australian Road Research Board*, Vol. 14, No. 1, March, 1-9

Used with permission of the author and the Scottish Government.

Hughes, P, and Cole, B (1986) 'What Attracts Attention When Driving?', *Ergonomics*, Vol. 29, No. 3, pp377-391

Ingwerson, P (1995) 'Tracing the Problem of Driver Fatigue', in Hartley, L (ed) *Fatigue and Driving*, London: Taylor and Francis

Irwin, D, Colcombe, A, Kramer, A, and Hohn, S (2000) 'Attentional and Oculomotor Capture by Onset, Luminance and Color Singletons', *Vision Research*, Vol. 40, pp1443-1458

Jenkins, S and Cole, B (1982) 'The Effect of the Density of Background Elements on the Conspicuity of Objects', *Vision Research*, Vol. 22, pp1241-1252

Jiang, Y, Chun, M, and Marks, L (2002) 'Visual Marking: Selective Attention to Asynchronous Temporal Groups', *Journal of Experimental Psychology*, Vol. 28, No. 3, pp717-730

Johannson, G and Rumar, K (1966) 'Drivers and Road Signs: A preliminary investigation of the capacity of car drivers to get information from road signs', *Ergonomics*, Vol. 9, No. 1, pp57-63

Johansson, G and Backlund, F (1970) 'Drivers and Road Signs', *Ergonomics*, Vol. 13, No. 6, pp749-759

Johnston, A and Cole, B (1976) 'Investigations of Distraction by Irrelevant Information', *Australian Road Research*, Vol. 6, No. 3, pp3-22

Juola, J, Koshino, H and Warner, C (1995) 'Tradeoffs Between Attentional Effects of Spatial Cues and Abrupt Onsets', *Perception and Psychophysics*, Vol. 57, No. 3, pp333-342

Just, M, Carpenter, P, Keller, T, Emery, L, Zajac, H, Thulborn, K (2001) 'Interdependence of Nonoverlapping Cortical Systems in Dual Cognitive Tasks', *NeuroImage*, Vol. 14, pp417-426

Kahneman, D, Rachel, B and Lotan, M (1973) 'Relation of a Test of Attention to Road Accidents', *Journal of Applied Psychology*, Vol. 58, pp113-115

Kalsbeek, J and Sykes, R (1967) 'Objective Measurement of Mental Load', *Acta Psychologica*, Vol. 27, 253-261

Kenny, P (1995) 'The Interaction between Driver Impairment and Road Design in the Causation of Road Crashes-Three Case Studies', in Hartley L (ed) *Fatigue and Driving*, London: Taylor and Francis

Klein, R (1991) 'Age-Related-Eye Disease, Visual Impairment, and Driving in the Elderly', *Human Factors*, Vol. 33, No. 5, pp521-525

Used with permission of the author and the Scottish Government.

Kuhn, B , Garvey, P Pietrucha, M (1997) 'Model Guidelines for Visibility of On-Premise Advertisment Signs', Transportation Research Record, 1605, 80-87

Lai, J, Cheng, K, Green, P and Tsimhoni, O (2001) 'On the Road and on the Web? Comprehension of synthetic and human speech while driving ' *CHI,* Vol. 3, No. 1, pp206-212

Lam, L (2002) 'Distractions and the Risk of Car Crash Injury: The effects of driver',s age', *Journal of Safety Research*, Vol. 33, pp411-419

Lamble, D, Tatu, K, Laakso, M and Summala, H (1999) 'Cognitive Load And Detection Thresholds in Car Following Situations: Safety Implications for Using Mobile (Cellular) Telephones While Driving', *Accident Analysis and Prevention*, Vol. 31, pp617–623

Land, M (1998) 'The Visual Control of Steering', in Harris, L and Jenkins, M (eds) *Vision in Action,* Cambridge: CUP

Land, M (2001) 'Does Steering a Car Involve Perception of the Velocity Flow Field?', In Zanker and Zeil (eds) 'Motion Vision-Computational, Neurological, and Ecological Constraints', Berlin: Springer Verlag

Land, M , Horwood, J (1995) 'Which Parts of the Road Guide Steering?', *Nature*, Vol. 377, pp339-340

Land, M and Lee, D (1994) 'Where we Look When we Steer', *Nature*, Vol. 369, pp742-744

Lansdown, T and Brook-Carter, N (2000) 'Project report pr/t/158/2000: Review of the Driver Distraction Internet Forum', Online: http://www lboro ac uk/research/esri/ttec/oracle/Internet%20driver%20distraction%20forum pdf

Lauer, A and McMonagle, J (1955) 'Do Roadside Signs Affect Accidents?', *Traffic Quarterly,* Vol. 9, No. 3, pp322-329

Leach, L and Kello, C (2002) 'The Effect of Attentional Distraction in the Tempo-Naming Task', Poster Presentation Given at *CogSci 2002.* Available online: http://hfac gmu edu/~cogsci/final_member_abstrs/leach_kello pdf

Leeming, J (1969) *Road Accidents*, London: Cassell

Lucas, M and Bub, D (1981) 'Can Practice Result in the Ability to Divide Attention Between Two Complex Language Tasks? Comment on Hirst et al ' *Journal of Experimental Psychology (General)*, Vol. 110, No. 4, pp495-498

MacBain, W (1970) 'Arousal, Monotony, and Accidents in Line Driving', *Journal of Applied Psychology*, Vol. 54, No. 6, pp509-519

MacDonald W (1991) 'Driver's Awareness of Traffic Sign Information', *Ergonomics*, Vol. 34, No. 5, pp585-612

Mack, A and Rock, I (1998) *Inattentional Blindness*, London: MIT Press

Used with permission of the author and the Scottish Government.

Mackworth, N and Morandi, A (1967) 'The Gaze Selects Informative Details Within Pictures', *Perception and Psychophysics,* Vol. 2, No. 11, pp547-552

Marinkovic, K, Halgren, E, and Maltzman, I (2001) 'Arousal-Related P3a to Novel Auditory Stimulus is Abolished by a Moderately Low Alcohol Dose', *Alcohol and Alcoholism*, Vol. 36, No. 6, pp529-539

Matthews, G, Sparkes, T, Bygrave, J (1996) 'Attentional Overload, Stress, and Simulated Driving Performance', *Human Performance*, Vol. 9, No. 1, pp77-101

McMonagle, J (1952a) 'Traffic Accidents and Roadside Features', *Highway Research Board Bulletin*, Vol. 55, pp38-48
McMonagle, J (1952b) 'The Effects of Roadside Features on Traffic Accidents', *Traffic Quarterly,* Vol. 6, No. 3, pp228-248

McLean, J and Hoffmann, E (1971) 'Analysis of Driver',s Control Movements', *Human Factors*, Vol. 13, No. 5, pp407-418

McLean J, and Hoffmann, E (1973) 'The Effects of Restricted Preview on Driver Steering Control and Performance', *Human Factors*, Vol. 15, No. 4, pp421-430

Means, T, Richey, J and Jones, R (1999) *Driven to Distraction: Road Signs as Factors in Auto Collision Cases*, Alabama: Thomas, Means, Gillis and Seay. Available online: http://tmgpc com/pubs/driven html

Minton, R (2003) 'Personal Communication to Author (Email)', 6th February, 13/03

Moray, N (1959) 'Attention in Dichotic Listening: Affective Cues and the Influence of Instructions', *Quarterly Journal of Experimental Psychology*, Vol. 11, pp56-60

Moray, N, (1990) 'Designing for Transportation Safety in the Light of Perception, Attention, and Mental Models', *Ergonomics*, Vol. 33,No.s 10-11, pp1201-1213

Mourant, R, and Rockwell, T (1970) 'Mapping Eye-Movement Patters to the Visual Scene in Driving: An Exploratory Study ' *Human Factors*, Vol. 12, No. 1, pp81-87

Mourant, R, and Rockwell, T (1972) 'Strategies of Visual Search by Novice and Experienced Drivers,', *Human Factors*, Vol. 14,No. 4, pp325-335

Mourant, R, Rockwell T, Rackoff, N (1969) 'Driver',s Eye Movements and Visual Workload', *Highway Research Record*, Vol. 292, pp1-10

Mourant, R, Tsai, F, Al Shihabi,T and Jaeger, B (2001) 'Divided Attention Ability of Young and Older Drivers', *Proceedings of the 80th Annual Meeting of the Transportation Research Board*, Available online http://www1 coe neu edu/~mourant/pubs/distraction2001 pdf

Moses, P (1995) 'Fatal Accidents in Western Australia', *Fatigue and Driving*, Hartley L (ed), London: Taylor and Francis

Used with permission of the author and the Scottish Government.

Müller, H, Heller, D and Ziegler, J (1995) 'Visual Search for Singleton Feature Targets Within and Across Feature Dimensions', *Perception and Psychophysics*, Vol. 57, No. 1, pp1-17

Najm, W, Mironer, M, Koziol, J, Wang, J and Knipling, R (1995) *Synthesis Report: Examination of Target Vehicular Crashes and Potential ITS Countermeasures*, Washington, DC: NHTSA

Neisser, U (1976) *Cognition and Reality*, San Francisco: W H Freeman

Neisser, U, Hirst, W and Spelke, E (1981) 'Limited Capacity Theories and the Notion of Automaticity: Reply to Lucas and Bub', *Journal of Experimental Psychology (General)*, Vol. 110, No. 4, pp499-500

Neuberger, (Mrs) (1963) 'Billboards and the High Accident Rate', *Congressional Record (Senate)*, Vol. 109, March 25, pp4839-4840

Norman, D, Bobrow, D (1975) 'On Data-Limited and Resource-Limited Processes', *Cognitive Psychology*, No. 7, 44-64

NHTSA (2000) *NHTSA Driver Distraction Internet Forum*, Available online: http://www-nrd nhtsa dot gov/pdf/nrd-13/FinalInternetForumReport pdf

NHTSA (2000) *NHTSA Driver Distraction Internet Forum: In-Vehicle Technologies: Experience and Research (Other) 'Question Those Statistics*. Available online: http://www-nrd nhtsa dot gov/departments/nrd-13/driver-distraction/Topics013660354 htm#A354

NHTSA (2001) *U S Department of Transportation National Highway Traffic Safety Administration National Center for Statistics & Analysis (text version) Crashworthiness Data System (CDS)*, Unpublished note Available online: http://www-nrd nhtsa dot gov/departments/nrd-30/ncsa/TextVer/CDS html

NHTSA (2001) *Statement of L Robert Shelton Executive Director National Highway Traffic Safety Administration Before the Subcommittee on Highways and Transit Committee on Tranportation and Infrastructure: U S House of Representatives,* NHTSA Online: http://www senate gov/~commerce/hearings/0424she PDF

Noë, A and O',Regan, K (2000) 'Perception, Attention and the Grand Illusion', *Psyche*, Vol. 6, No. 15, pp1-8. Available online: http://psyche cs monash edu au/v6/psyche-6-15-noe html

Norris, F, Matthews, B and Riad, J (2000) 'Characterological, Situational, and Behavioural Risk Factors for Motor Vehicle Accidents', *Accident Analysis and Prevention*, Vol. 32, pp505-515

Olsson, S and Burns, P (2000) 'Measuring Driver Visual Distraction with a Peripheral Detection Task', Obtained from *August 2000 The National Highway Traffic Safety Administration Driver Distraction Internet Forum on the World Wide Web* http://www-nrd nhtsa dot gov/departments/nrd-13/driver-distraction/PDF/6 PDF

Used with permission of the author and the Scottish Government.

Pavlov, I (1927) 'Conditioned Reflexes: An Investigation of the Physiological Activity of the Cerebral Cortex: Lecture 1',. Available online: http://psychclassics yorku ca/Pavlov/lecture1 htm

Peters, G and Peters B (2002) 'The Distracted', *Professional Safety*, Vol. 47, No. 3, pp34-50

Potter, M (1975) 'Meaning in Visual Search', *Science*, 187, 965-966

Preusser, D, Williams, A, Ferguson, S, Ulmer, R and Weinstein, H (1998) 'Fatal Crash Risk for Older Drivers at Intersections', *Accident Analysis and Prevention*, Vol. 30, No. 2, pp151-159

Ranney, T (1993) 'Models of Driving Behaviour: A Review of their evolution', *Accident Analysis and Prevention*, Vol. 26, No. 6, pp733-750

Redelmeier, D, and Tibshirani, R (1997) 'Association Between Cellular-Telephone Calls and Motor Vehicle Collisions', *New England Journal of Medicine*, Vol. 336, No. 7, pp453-458

Rees, G, Frith, C and Lavie, N (1997) 'Modulating Irrelevant Motion Perception by Varying Attentional Load in an Unrelated Task', *Science*, Vol. 278, pp1616-1620

Remington, R, Johnston, J and Yantis, S (1992) 'Involuntary Attentional Capture by Abrupt Onsets', *Perception and Psychophysics*, Vol. 51, No. 3, pp279-290

Richard, C, Wright, R, Ee, C, Prime, S, Shimuzu, Y and Vavrik, J (2002) 'Effects of a Concurrent Auditory Task on Visual Search Performance in a Driving-Related Image-Flicker Task', *Human Factors*, Vol. 1, No. 2, pp108-119

Robinson, G (1972) 'Visual Search by Automobile Drivers', *Human Factors*, Vol. 14, No. 4, pp315-323

Rosenbloom, T and Wolf, Y (2002) 'Signal Detection in Conditions of Everyday Life Traffic Dilemmas', *Accident Analysis and Prevention*, Vol. 34, pp763-772

Rosselló, J, Munar, E, Justo, S and Arias, R (1999) 'Effects of Alcohol on Divided Attention and on Accuracy of Attentional Shift', *Psychology in Spain*, Vol. 3, No. 1, pp69-74

Royal Society for the Prevention of Accidents (RoSPA) (1997) 'Mobile Phones and Driving: A literature review', Available online http://www rospa com/pdfs/road/mobiles/review pdf

Royal Society for the Prevention of Accidents (RoSPA) (2002) 'The Risk of Using a Mobile Phone While Driving', Available online: http://www rospa com/pdfs/road/mobiles/report pdf

Rumar, K (1990) 'The Basic Driver Error: Late Detection', Ergonomics 33, 10-11, 1281-1290

Rumar, K (1994) 'Human Factors in Road Traffic', in Jansson, G, Bergström, S and Epstein, W (eds) *Perceiving Objects and Events*, Hillsdale: Lawrence Erlbaum

Used with permission of the author and the Scottish Government.

Rusch, W (1951) 'Highway Accident Rates as Related to Roadside Business and Advertising', *Highway Research Board Bulletin*, Vol. 30, pp46-50

Ruz, M, Lupiáñez, J (2002) 'A Review of Attentional Capture: On its Automaticity and Sensitivity to Endogenous Control', *Psicológica,* Vol. 23, pp283-309

Sabey, B, and Staughton, G (1975) 'Interacting Roles of Road Environment Vehicle and Road User in Accidents', Paper Presented to the *5th International Conference of the International Association for Accident and Traffic Medicine,* and the *3rd International Council on Alcohol and Addiction*

Salvucci, D (2002) 'Modelling Driver Distraction from Cognitive Tasks', *Proceedings of the Conference of the Cognitive Science Society*, Hillsdale, NJ: Lawrence Ferlbaum

Scenic America (2001) 'Warning Signs: Billboards, Signs, and Traffic Safety', Washington DC: Scenic America

Schieber, F (1998) 'Recent Developments in Vision, Ageing and Driving 1998-1994', *Technical Report*, Available online: http://www usd edu/~schieber/pdf/umtri pdf

Senders, J, Kristofferson, A, Levison, W, Dietrich, C and Ward, J (1967) 'The Attentional Demands of Automobile Driving', Highway Research Record, 195, 15- 33

Shen, J and Reingold, E (2002) 'Saccadic Selectivity During Visual Search: The effects of Shape and Stimulus Familiarity', In Hahn, M and Stones S (eds) *Proceedings of the Twenty First Annual Conference of the Cognitive Science Society*, Mahweh, NJ: Lawrence Erlbaum

Shannon, C (1948) 'A mathematical theory of communication', *Bell System Technical Journal,* Vol. 27, pp379-423 and pp623-656, July and October

Sheridan, T (2000) ''Reliance', and 'distraction', effects in PTC automation', *The Locomotive Engineer Newsletter*, No. 1

Shinar, D (1977) 'Eye Movements in Curve Negotiation', *Human Factors*, Vol. 19, No. 1, pp63-71

Shinar, D (1993) 'Traffic Safety and Individual Differences in Driver's Attention and Information Processing Capacity', *Alcohol, Drugs and Driving*, Vol. 9, No. 3-4, pp219-237

Shinar, D and Scheiber, F (1991) 'Visual Requirements for Safety and Mobility of Older Drivers', *Human Factors*, Vol. 35, No. 5, pp507-519

Shinar, D , Zaidel, D , Paarlberg, W , (1978) 'Driver Performance and Individual Differences in Attention and Information Processing Volume 1: Driver Inattention', NTIS, Springfield

Shoaf, R (1955) 'Are Advertising Signs Near Freeways Traffic Hazards?', *Traffic Engineering,* Vol. 26, pp71-79

Simons, D, Chabris, D (1999) 'Gorillas in our Midst: Sustained Inattentional Blindess for Dynamic Events', *Perception*, Vol. 28, No. 9, pp1059-1074

Used with permission of the author and the Scottish Government.

Sodhi, M , Reimer, B and Lamazeres, I (2002) 'Glance Analysis of Driver Eye Movements', *Behaviour Research Methods, Instruments and Computers* (in print)

Sommervell, J, Srinivasan, R, Woods, K and Vasnaik, O (2001) 'Measuring Distraction and Awareness Caused by Graphical and Textual Displays in the Periphery', In *Proceedings of the 39th Annual ACM Southeast Conference*, March 16-17, 2001 Athens, GA Available online: http://csgrad cs vt edu/~jsomerve/

Spelke, E , Hirst, W, Neisser, U (1976) 'Skills of Divided Attention', *Cognition,* Vol. 4, pp215-230

Sperling, G, Wurst, S, Zhong-Lin, L (1993) 'Using Repetition Detection to define and Localise the Processes of Selective Attention,', in Meyer, D & Kornblum, S (eds) *Attention and Performance XIV,* London and Cambridge, Mass : MIT Press

Staffeld, P (1953) 'Accidents Related to Access Points and Advertising Signs in Study', Traffic Quarterly, 7, 11, 59-74

Stanton, N, Young, M (2001) *Developing a Psychological Model of the Driver*, London: Department of Transport. Available online: http://www roads dft gov uk/roadsafety/behaviour/11 htm

Staplin, L, Karlene, B, Park, D, Decina, L and Lococo, K, Gish, K, Kotwal, B (1997) *Synthesis of Human Factors Research on Older Drivers and Highway Safety*, U S Dept of Transport (FHA): McLean, Virginia

Stevens, A and Minton, R (2001) 'In-Vehicle Distraction and Fatal Accidents in England and Wales', *Accident Analysis and Prevention*, Vol. 33, pp539-545

Streff, F and Spradlin, H (2000) *Driver Distraction, Aggression, and Fatigue: A Synthesis of the Literature and Guidelines for Michigan Planning*, University of Michigan: Transportation Research Institute

Stutts, J, Reinfurth, D, Staplin, L, Rodgeman, E (2001) *The Role of Driver Distraction in Traffic Crashes,* Washington DC: AAA Foundation Online http://www aaafoundation org/pdf/distraction pdf

Sussman, E, Bishop, H, Madnick, B, Walter, R (1985) 'Driver Inattention and Highway Safety', *Transportation Research Record*, Vol. 1047, pp40-49, Transportation Research Board: Washington DC

Tellegen, A, & Atkinson, G (1974) 'Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility', *Journal of Abnormal Psychology*, Vol. 83, pp268-277

Tessmer J (2000) *Capturing Variables Indicating Driver Distraction in Large Electronic Files*, unpublished note. Available online http://www-nrd nhtsa dot gov/PDF/nrd-13/TessmerJ_ppt pdf

Used with permission of the author and the Scottish Government.

Thackray, R, Jones, K and Touchstone, R (1973) 'Self-estimates of Distractibility as Related to Performance Decrement on a Task Requiring Sustained Attention', *Human Factors*, Vol. 16, No. 2, pp141-152

Theeuwes, J (1991) 'Visual Selection: Exogenous and Endogenous Control', In Gale, AG et al (eds) *Vision in Vehicles III* , North Holland: Elsevier

Theeuwes, J, Atchley, P and Kramer, A (1998) 'Attentional Control Within 3-D Space', *Journal of Experimental Psychology: Human Perception and Performance*, Vol. 24, No. 5, pp1476-1485

Theewues, J and Godjin, R, (2001) 'Attention and Oculomotor Capture', in Folk, CI , and Gibson, BS, *Attention, Distraction and Action: Multiple Perspectives on Attentional Capture*, Amsterdam: Elsevier

Theeuwes J and Godjin, R (in press) 'Irrelevant Singletons Capture Attention: Evidence from Inhibition of Return' *Perception and Psychopysics*

Thiffault, P and Bergeron J (in press) 'Monotony of road environment and driver fatigue: a simulator study', *Accident Analysis and Prevention*

Thomas, E (1968) 'Movements of the Eye', *Scientific American*, Vol. 219, No. 2, pp88-95

Tokunaga, R, Hagiwara, T, Kagaya, S, Onodera, Y (2001) 'Cellular Telephone Conversation While Driving', *Transportation Research Record*, Vol. 1724, pp1-6

Treat, J, Tumbas, N, McDonald, S, Shinar, D, Hume, R, Mayer, R, Stansifer, R and Castellan, N (1979a) *Tri-Level Study of the Causes of Traffic Accidents: Executive Summary*, Washington: National Highway Traffic Safety Administration

Treat, J, Tumbas, N, McDonald, S, Shinar, D, Hume, R, Mayer, R, Stansifer, R and Castellan, N (1979b) *Tri-Level Study of the Causes of Traffic Accidents: Volume 1: Causal Factor Tabulations and Assessments*, Washington: National Highway Traffic Safety Administration

Treisman, A, (1964a) 'Verbal Cues, Language and Meaning in Selective Attention', *American Journal of Psychology*, No. 77, pp206-219

Treisman, A (1964b) 'The Effect of Irrelevant Material on the Efficiency of Selective Listening', *American Journal of Psychology*, No. 77, pp533-546

Tufano, D (1997) 'Automotive HUDs: the Overlooked Safety Issues', *Human Factors*, Vol. 39, No. 2, pp303-311

University of North Carolina (2001) *University of North Carolina Highway Safety Research Center Study on Distracted Driving: Outline of Results, Methodology, and Data Limitations.* Available online: http://www aaafoundation org/projects/index cfm?button=disdrvstudylim

Used with permission of the author and the Scottish Government.

Uno, H and Hiramitsu, K (2000) 'Effects of Auditory Distractions on Driving Behaviour During Lane Change Course Negotiation: Estimation of Spare Mental Capacity as an Index of Attention Distraction', *JSAE Review*, Vol. 21, pp219-224

US Department of Transportation (1993) *Addressing the Safety Issues Related to Younger and Older Drivers*,. Available online: http://www nhtsa dot gov/people/injury/olddrive/pub/yorept html#Table%20of%20Contents

US Department of Transportation (1999) *National Automotive Sampling System (NASS) General Estimates System (GES): Analytical Users Manual 1998-1999*, Washington, DC: NHTSA

Van der Heijden, A (1992) *Selective Attention in Vision*, London: Routledge

Varela, F, Thompson, E and Rosch, E (1991) *The Embodied Mind: Cognitive science and human experience,* Cambridge, MA: MIT Press

Versace, J (1960) 'Factor Analysis of Roadway and Accident Data', *Highway Research Board Bulletin,* Vol. 240, pp24-30

Victor, T (2000) *A Technical Platform for Driver Inattention Research*, Washington DC: NHSA. Available online: http://www-nrd nhtsa dot gov/departments/nrd-13/driver-distraction/PDF/7 PDF

Violanti J (1998)',Cellular Phones and Fatal Traffic Collisions', *Accident Analysis & Prevention,* Vol. 30, No. 4, pp519-524

Wallace, B, Ross, A, Davies, J.B, and Wright, L (2002) 'Information, Arousal and Control in the UK Railway Industry: a Focus Group Study', in Thatcher, Fisher & Miller (eds) *The Third International Cyberspace Conference on Ergonomics,* Johannesburg, International Ergonomics Association Press.

Waller, P (1991) 'The Older Driver', *Human Factors*, Vol. 33, No. 5, pp499-505

Wang, J, Knipling, R, Goodman, M (1996) 'The Role of Driver Inattention in Crashes: New Statistics from the 1995 Crashworthiness Data System', *40th Annual Proceedings of the Association for the Advancement of Automotive Medicine* Available online http://www itsdocs fhwa dot gov/jpodocs/repts_te/ll01! pdf

Watchtel, J. and Netherton, R (1980). Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage. Report No. FHWA-RD-80-051. Washington, D.C: Federal Highway Administration

Welford, A (1962) 'Arousal, Channel-Capacity, and Decision', *Nature*, Vol. 19, pp365-366

Wierville, W, Tijerina, L (1996) 'An Analysis of Driving Accident Narratives as a Means of Determining Problems Caused by In-Vehicle Visual Allocation and Visual Workload', In Gale AG et al (eds) *Vision in Vehicles –V*, North-Holland: Elsevier.

Used with permission of the author and the Scottish Government.

Williams, L (1985) 'Tunnel Vision Induced by a Foveal Load Manipulation', *Human Factors*, Vol. 27, No. 2, pp221-227

Withington, D (1998) 'Siren Sounds: Do They Actually Contribute to Traffic Accidents?', *Impact*, Vol. 7, No. 1, pp6-7

Wolfe, J (1998) 'Visual Search', in Pashler (ed) *Attention,* London: University College Press

Wolfe, J , O'Neill, P , and Bennett, S (1998) 'Why Are There Eccentricity Effects in Visual Search? Visual and Attentional Hypotheses', *Perception and Psychophysics*, Vol. 60, No.1, pp140-156

Yantis, S, Jonides, J (1990) 'Abrupt Visual Onsets and Selective Attention: Voluntary versus Automatic Allocation', *Journal of Experimental Psychology: Human Perception and Performance*, 16,1, 121-134

Yantis, S, Johnston, J (1990) 'On the Locus of Visual Selection: Evidence from Focused Attention Tasks', *Journal of Experimental Psychology: Human Perception and Performance,* Vol. 16, No. 1, pp135-149

Yerkes, R and Dodson, J (1908) 'The Relation of Strength of Stimulus to Rapidity of Habit-Formation', *Journal of Comparative Neurology and Psychology,* No. 18, pp459-482

Young, M and Stanton, N (2002) 'Malleable Attentional Resources Theory: A New Explanation for the Effects of Mental Underload on Performance', *Human Factors*, Vol. 44, No. 3, pp365-375

Zakowska, O (2001) 'Relation to Drivers Characteristics and Safety-A Case Study in Poland', *14th ICTCT workshop*. Available online: http://www ictct org/workshops/01-Caserta/Zakowska pdf

Zuckerman, M (1979) *Sensation Seeking,* New York: Hillsdale Erlbaum

Used with permission of the author and the Scottish Government.

ANNEX TWO SEARCH METHODOLOGIES

Note: search methodologies became more 'specific' as the research moved from attentional research to the specific area of billboard driver distraction There were simply too many studies of 'attention' in psychology to reference them all in a research programme of this scale It is hoped that a representative sample of current research has been selected However, in terms of billboards, given the small amount of research, all available research has been collated

1: Search Engines Used

WWW: 'Google' Search Engine (**http://www google com**)
Altavista (**http://www/altavista com**)
Yahoo (**http://www yahoo co uk)**

2: Databases Consulted

Analytical Abstracts
Arts and Humanities Citation Index
Biological and Medical Science
BIDS
Business and Industry
Cochrane Library
Embase
Emerald
Engineering Science Data Unit
IBSS
Journal Citation Reports: Science/Social Science
Medline
Omnifile
Psycinfo
Science Citation Index
Social Sciences
Social Sciences Citation Index
Sociological Abstracts
Westlaw
Zetoc

3: Search Phrases used on Web and above databases

'driver distraction'
'cognitive distraction'
'driver inattention'
'driver attention'
'attention and billboards'
'billboards'

Used with permission of the author and the Scottish Government.

4: People contacted: (and who provided names and/or further contacts unless otherwise stated)

Ian Anderson (ScottishGov)
John Anderson (Loughborough University)
Barkers Advertising (Scotland)
Peter Chapman (Nottingham University)
Dave Curry (Director, Human Factors Packer Engineering)
Gita Curnow (Australian Transport Safety Bureau)
Lisa Dorn (Cranfield University)
Catherine Duggan (Scottish Gov)
Rhona Flyn (Aberdeen University)
Linden Francis (Department of Statistics, Department of Transport, Roads)
Sarah Groombridge (TRL)
Joanne Harbluck (Transport Canada)
Andrew Howard (AA)
HSE
Michael Land (Sussex University)
Professor Frank McKenna (University of Reading)
Donna Mitchell (Communications Team, Advertising Standards Authority)
RAC (contacted but has not yet replied)
RoSPA
Steven Shorrock (DNV com)
Robert Snowden (Cardiff University)
Martine Stead, (Department of Social Marketing Strathclyde University)
Dr James Thompson (University of Strathclyde)
Upali Vandebona, (University of New South Wales)
Mark Young (Railway Safety)

NOTE: All contacts were via email

5: Organisations Joined

'Eurostat' (European Statistics)
'Vision in Vehicles' (on line discussion forum)

Used with permission of the author and the Scottish Government.

GLOSSARY

'Bottom Up' Perception: Situations where information is brought to attention involuntarily.

Cognitive Overload: Refers to situations where the subject is overloaded with too much information. 'Stress'.

Cognitive Underload: Refers to situation where the subject does not have access to adequate levels of information. 'Boredom'.

Endogenous attention: Voluntary orienting response (cf. 'top down' perception)

Exogenous attention: Reflexive (automatic) orienting response (cf. 'bottom up' perception)

Saccadic: Saccadic eye movements are brief movements of the eye, normally lasting a third of a second or less. This is the normal way for the eye to 'sample' the visual environment.

Task Unrelated Imagery and Thought (TUIT): Daydreaming (sometimes shortened to Task Unrelated Thought: TUT).

'Top Down' Perception: Situations where information is voluntarily brought to attention.

Yerkes-Dodson Law: The law that defines the relation of arousal to task performance.

Used with permission of the author and the Scottish Government.

ISSN 0950 2254
ISBN 0 7559 3573 X
Price £5.00

www.scotland.gov.uk/socialresearch

The text pages of this document are produced from 100% Elemental Chlorine-Free material.
The paper carries the Nordic Ecolabel for low emissions during production, and is 100% recyclable.

Astron B31535 7/03

Used with permission of the author and the Scottish Government.

ISBN 0-7559-3573-X
9 780755 935734

Transportation Synthesis Report

Nina McLawhorn
Research Administrator
Wisconsin Department of Transportation
608-266-3199
nina.mclawhorn@dot.state.wi.us

Electronic Billboards and Highway Safety

Prepared for
Bureau of Highway Operations
Division of Transportation Infrastructure Development

Prepared by
CTC & Associates LLC
WisDOT RD&T Program
May 2/June 10, 2003

Transportation Synthesis Reports (TSRs) are brief summaries of currently available information on topics of interest to WisDOT technical staff in highway development, construction and operations. Online and print sources include NCHRP and other TRB programs, AASHTO, the research and practices of other state DOTs, and related academic and industry research.

REQUEST FOR REPORT

Advances in outdoor display technology, and decreases in cost, support an interest in expanding deployment of high resolution and dynamic imaging in outdoor advertising. Technology has advanced sufficiently for electronic billboards (EBBs) to provide dynamic and realistic views much like color television. The advanced EBB has the capability to present multiple views and objects that have realistic motion. In contrast, tri-vision signs provide one of three views with rotating cylinders and generate mechanical motion or movement.

This raises questions about the effects that EBBs and tri-vision signs may have on driver distraction and highway safety. The RD&T Program was asked to report on the measured or predicted safety impacts of outdoor electronic advertising signs.

SUMMARY

We located two FHWA resources that are especially helpful for getting familiar with the issues: the Office of Real Estate Services (ORES) Web site and the study entitled *Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*. We provide links to the items and excerpts below, in the **Overview** section. The study affords an in-depth look at how states are regulating electronic outdoor advertising, from lenient control at one end to the prohibition of outdoor advertising at the other. Wisconsin addresses the issue with rules for the content, timing and brightness of EBBs and tri-vision signs. See **Wisconsin Regulations**. However, standard billboard guidelines governing EBBs and tri-vision signs do not exist: few states, in fact, define the term "electronic billboard." See **State and Local Studies**. Research on the issue of electronic ads causing driver distraction would suggest that the jury is still out. While some studies conclude that extra-vehicular distractions cause crashes, it has proven difficult to identify and measure the role of electronic advertising in driver distraction. See **Driver Distraction**. However, promising methodologies have been proposed for focused study of the issue, and for trimming the risk of driver distraction from electronic advertising. See **Avenues for Research**.

OVERVIEW

Outdoor ad spending in the U.S. rose 8 percent in 2000 to $5.2 billion. Advanced electronic billboards will explode, according to one industry specialist, in towns with "street excitement and extravaganza" like Orlando, Las Vegas,

Used with permission.

Hollywood, wherever large numbers of people congregate, though laws and safety issues may keep them off most highways.

A few years ago cities like New York and Los Angeles embraced what Hollywood's zoning department calls "jumbotrons" as a rejuvenating tool for shabby crossroads, but now cities are demanding tighter regulations. Los Angeles, a driver's city, wants hours of dimming. Many in the advertising sector see the light-emitting diode sign as the future of outdoor billboards. LED screens that recently debuted on L.A.'s Sunset strip bombard passing motorists with movie trailers, commercials and music videos. (From *The Clock* magazine, April 2001: http://www.theclockmag.com/acrobat/minute_by_minute.pdf)

A detailed history and overview of the federal outdoor advertising control program can be found on the FHWA's Office of Real Estate Services (ORES) Web site: http://www.fhwa.dot.gov/realestate/oacprog.htm. In a July 1996 memorandum to FHWA regional administrators, ORES provided additional interpretation of advertising technology to the individual states regarding off-premise changeable message signs: "Changeable message signs are acceptable for off-premise signs regardless of the type of technology used, if the interpretation of the State/Federal agreement allows such signs." In 1998, ORES reaffirmed its policy that off-premise signs using animated or scrolling displays that are dependent on flashing, intermittent or moving lights were not conforming signs. This decision was made after careful review of a videotape showing a full-motion EBB erected in Scottsbluff, Nebraska. It was concluded that such signs raise "significant highway safety questions because of the potential to be extremely bright, rapidly changing and distracting to motorists."

A majority of states have policies regarding the lighting of billboards; these policies have the effect of regulating EBBs.

A helpful overview of the EBB and tri-vision sign issue is provided in the study *Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction* (FHWA, Sept. 11, 2001- http://www.fhwa.dot.gov////realestate/elecbbrd/elecbbrd.pdf). This report is a research review of potential safety implications of EBBs on driving safety. It covers the interval since a similar review was published in 1980. The study focuses on the safety aspects of EBBs and does not examine aesthetic issues. Included are a review of research on driver performance in the presence of EBBs and contacts with federal and state officials to describe state regulatory practices concerning EBBs. An account of tri-vision signs is a part of the state review. Knowledge gaps are identified based on the literature review and these gaps support the development of a set of research questions and related research findings.

From the report:

- (p. 8) Determining the effect of roadway commercial advertising billboards on safety is a difficult endeavor for several theoretical and methodological reasons.
- (p. 9) Summary of a 1994 WisDOT study examining crash rates on I-94 three years before and three years after the installation of a variable message advertising sign.
- (p. 20) At this point, it appears that there is no effective technique or method appropriate for evaluating the safety effects of EBBs on driver attention or distraction.
- (p. 19) One approach being developed for in-vehicle information systems may serve, with some refinement, as a measure of EBB distraction.
- (p. 13) Although the CMS is restricted to providing roadway related information, its legibility requirements may be relevant to the design of the simpler EBB.
- (p. 29) Although research into in-vehicle cellular telephone use does not currently appear to have direct application to EBBs or tri-vision signs, these analyses are ongoing and may still provide insights into the nature of driver distraction, the definition of distraction thresholds and approaches to minimizing distraction for safe driving.

A study performed for the South African National Roads Agency Limited (SANRAL) looks closely at the matter of *content* regulation for outdoor advertising. SANRAL promulgated regulations on outdoor advertising and control in December 2000. In applying the regulations, several problems were experienced with the evaluation of content. The study was launched to investigate an analytical approach to evaluating advertisement contents based on driver characteristics. A parallel is drawn between the reading of road signs and the reading of outdoor advertisements. A

concept of the critical zone—the 500 meters in front of an advertisement—is developed, and the control of content in this zone is quantified. Rules are proposed to evaluate the content for advertisements that are intended to provide "a more practical, defendable approach to evaluating the content of outdoor advertisements." The report can be viewed at http://www.its-traffic.co.za/publications/SANRAL%20face%20evaluation%20presentation.pdf

WISCONSIN REGULATIONS

Chapter Trans 201 of the Wisconsin Administrative Code states the rules that control outdoor advertising along and visible from highways on the interstate and federal-aid primary systems. Sections of the chapter that will interest readers of this report may be found at http://www.legis.state.wi.us/rsb/code/trans/trans201.pdf, including:

Trans 201.05 – Directional and official signs.

Trans 201.06 – Sign criteria.

Trans 201.19 – On-property signs.

Trans 201.15 – Electronic signs. This section sets standards for the use of signs whose messages may be changed by electronic process. Rules are defined for content, timing and brightness for multiple message (tri-vision) signs, and variable message (EBB) signs. The guidelines include:

Tri-vision signs

- The louver rotation time to change a message shall be one second or less;
- The time a message remains in a fixed position shall be six seconds or more.

EBBs

- No message may be displayed for less than one-half second;
- No message may be repeated at intervals of less than two seconds;
- No segmented message may last longer than 10 seconds;
- No traveling message may travel at a rate slower than 16 light columns per second or faster than 32 columns per second;
- No variable message sign lamp may be illuminated to a degree of brightness that is greater than necessary for adequate visibility.

STATE AND LOCAL STUDIES

The safety and aesthetics of commercial electronic variable message signing were reviewed by the FHWA in 1980.[1] Part of that effort included a review of published studies on the safety effect of roadside advertising signs, including several field and laboratory studies from 1951 to 1978 on non-electronic advertising billboards, and one analysis in 1976 of an electronic advertising sign in Boston. Among the findings:

1961: A study of California Route 40 concluded that road segments with billboards experienced significantly more crashes than segments without billboards.

1967: A field study compared the crash history of three locations in Chicago before and after the installation of three illuminated, commercial changeable message signs. Crash rates did not change at two of the sign locations, but the third sign location showed an increase in crashes. The third sign had alternating lights, showed several advertising messages and was illuminated by bright white lights. The rapid increase in crashes led state highway officials to request that blue lights replace the white lights.

1976: The Tele-Spot sign in Boston was an off-premise commercial electronic sign. The sign was visible from the Central Artery in the midst of complex on- and off-ramps, regulatory signs and guide signing. The Massachusetts Outdoor Advertising Board conducted an analysis of traffic crashes three years before and two and a quarter years after sign installation. The analysis showed an overall reduction in the Average Daily Traffic (ADT) and crashes along the expressway, but on the areas of the expressway from where the Tele-Spot was visible, the crash reduction was 10 percent less than the overall reduction. The board regarded the 10-percent difference as an indication that the Tele-Spot sign was a distraction and a safety risk, and consequently revoked the license for the sign.

([1]*Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage*
Wachtel, J. and Netherton, R. [1980]
Report No. FHWA-RD-80-051. Washington, D.C: Federal Highway Administration)

Regarding tri-vision signs, a 1999 survey sponsored by and presented at the annual National Alliance of Highway Beautification Agencies (NAHBA) Conference reviewed the advertising regulations for these signs in every state and Washington, D.C:

- Nine states (18 percent) had no regulations on tri-vision signs.
- Nine states had regulations on tri-vision signs that were either being drafted or in pending legislation.
- Nine states had specific regulations governing tri-vision signs.
- Six states as well as Washington, D.C. prohibited tri-vision signs.
- Fifteen states had regulations regarding moving parts and/or lights.

The survey presented the Minimum Exposure Dwell Time and Maximum Transition Twirl time boundaries of several state tri-vision sign policies.

Overall, while common themes are present in most lighting regulations, each state's laws have unique wording. A review of state outdoor advertising regulations conducted for the 2001 FHWA study revealed that common billboard guidelines governing EBBs and tri-vision signs do not exist. While the 42 states reviewed generally have consistent regulations governing static billboards, regulations covering EBBs and tri-vision signs vary widely, and implementation practices differ significantly from state to state. Few states define the term "electronic billboard." A broad spectrum of regulations exists, ranging from lenient control to the prohibition of outdoor advertising.

Included in the findings:

- Only 10 of the 42 states (24 percent) prohibit moving or animated parts in signs, unless the signs are a public service announcement. A few states make an exception for movement related to the changing of a sign.
- Twelve states (29 percent) include some type of timing limit for the viewing of signs. Of these, only eight apply to EBBs or other types of signs with changing messages.
- Most states (36) prohibit signs that include a red, flashing, intermittent or moving light, unless it is a public service display.
- Most states (36) prohibit signs that are not sufficiently shielded to prevent beams or rays of light from causing a glare or vision impairment that affects driver vision.

Based on the review, the report identifies the following issues that may pertain to EBBs: red, flashing, intermittent or moving lights; glare; use of traffic control device (TCD) symbols and words; illumination or placement interfering with a TCD; and spacing and timing limits. Of the potential issues, timing limits may be the one issue where additional or expanded research would have the most significant benefit.

In more recent developments:

- Focusing on transportation and tourism in Vermont, Brian Searles, Secretary of the Vermont Agency of Transportation, said that the state's biggest challenge is to resolve the clash between providing appropriate development of transportation infrastructure and retaining natural beauty. Tourism is an international business for the state, responsible for $4 billion annually. Because 80 percent of tourists travel by car, he said that the state has eliminated roadside billboards, controlled development at interchanges, and applied flexibility in bridge design. (From AASHTO Weekly Transportation Report June 1, 2001: http://www.aashto.org/publications/journal.nsf/SearchSite/75D49BC8E9D64BF086256A8B00088B72?OpenDocument&Highlight=billboards. Scroll down to section on Transportation Ties to Agriculture, Recreation Examined.)
- The Oregon Department of Transportation proposed to amend the Highway Beautification Federal/State Agreement of Aug. 26, 1974, between the U.S. and the State of Oregon, to permit the use of tri-vision signs adjacent to routes controlled under the Highway Beautification Act. (From AASHTO Regs Report Aug. 22, 2001: http://www.aashto.org/publications/regs.nsf/SearchSite/1CE55B45DD85BC1D86256AB0006C202C?OpenDocument&Highlight=outdoor%20advertising)
- Legislation was approved by the Arizona House of Representatives to permit billboards to have 200-square-foot sections with lighted messages that change every six seconds. The vote came despite claims by the Arizona Department of Transportation that permitting these kinds of signs along state freeways and roads violates federal laws. The violation, according to ADOT lobbyist Kevin Biesty, could cost Arizona $50 million in federal aid. (From the Arizona Daily Star, March 12, 2003: Web link not available.)

- The above bill (SB1138) contradicted efforts represented by tough Flagstaff and Coconino County ordinances that control light pollution and another bill passed by the Legislature that requires shielded lights for new state buildings. Flagstaff is a hub for astronomical research in Arizona. Officials said that although illuminated billboards are either banned or strictly regulated under Coconino County and Flagstaff ordinances, passage of the bill could embolden the outdoor advertising industry to take a run at local regulations. (From the *Tucson Citizen,* April 24, 2003: http://www.tucsoncitizen.com/breaking/archive/4_24_03dark_skies.html)

DRIVER DISTRACTION

Commercial EBBs are designed to "catch the eye" of drivers.* Their presence may distract drivers from concentrating on the driving task and the visual surrounds.[2]

*From Outdoor Advertising Association of America Web site at http://www.oaaa.org/outdoor/:

1. … Today the advances in computer imaging and reproduction make even photographic renditions absolutely breathtaking regardless of size. Such advances have not only allowed greater durability but also entire new forms of outdoor to emerge: wallscapes, wrapped buildings, the conversion of construction sites into marketing events.
2. Technology has enabled virtually anything imaginable. The wonders out there go far beyond an oversized pretty picture. A medium that began as a simple two-dimensional sign can now talk to you (via short wave radio links), download data into your Palm Pilot (through a patented Street Beam device), connect you to the Internet (via souped-up taxi tops), and change as you pass by (through motion detectors). Add this to old-fashioned LED boards and the "no-holds-barred" street theater of Times Square and, well, you get the picture.
3. … Outdoor IS the message, and as such will always be the last mass medium, a sure fire way to get noticed, to draw attention, ultimately to sell… which is, after all, outdoor's raison d'etre. So as long as there are widgets in search of a buyer, outdoor will be out there, outdoing everything else!

([2]*Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*- FHWA, Sept. 11, 2001- p. 17
http://www.fhwa.dot.gov////realestate/elecbbrd/elecbbrd.pdf)

The safety consequences of distraction from the driving task can be profound.

In one study, five years (1995 to 1999) of national Crashworthiness Data System (CDS) data are analyzed to determine the role of driver distraction in traffic crashes and the specific sources of this distraction. Results show that 8.3 percent of the drivers were distracted at the time of their crash; after adjustment for the large percentage of drivers with unknown distraction status, the percentage rose to 12.9 percent. The most frequently cited sources of driver distraction were persons, objects or events outside the vehicle (29.4 percent of distracted drivers); adjusting the radio, tape or CD player (11.4 percent); and other occupants in the vehicle (10.9 percent). Other specific distractions (moving objects in vehicle, other objects brought into vehicle, adjusting vehicle or climate controls, eating and drinking, cell phones and smoking) were each cited in only 1 to 4 percent of the cases. The likelihood of being distracted and the source of distraction varied by driver age but not by gender.[3]

([3]abstract: "The Role of Driver Distraction in Crashes: An Analysis of 1995-1999 Crashworthiness Data System Data-Association for the Advancement of Automotive Medicine," 2001
http://199.79.179.82/sundev/detail.cfm?ANNUMBER=00923438&STARTROW=91&CFID=179748&CFTOKEN=35097404)

Treat et al. found that driver inattention and improper lookout increase the likelihood of crash occurrence and are major factors underlying the causes of crashes.[4] According to Wang, et al., an analysis conducted by the National Highway Traffic Safety Administration (NHTSA) of causal factors of crashes showed that distraction by sources external to the vehicle accounted for 3.2 percent of the crashes. The external sources included people, events and non-specified objects.[5] The NHTSA analysis did not identify the external objects, nor did it identify billboards as among the sources of distraction. However, the data suggest that, on occasion, external stimuli can be sufficiently distracting to drivers, causing or resulting in a crash.[6]

([4]*Tri-Level Study of the Causes of Traffic Accidents*
Treat, J.R.; Tumbas, N.S.; McDonald, S.T.; Shinar, D.; Hume, R.D.; Mayer, R.E.; Stanisfer, R.L.; and Castellan, N.J. [1979] Washington, D.C.: National Highway Traffic Safety Administration)

([5]*The Role of Driver Inattention in Crashes: New Statistics from the 1995 Crashworthiness Data System*
Wang, J., Knipling, R. and Goodman, M. [2000]
Obtained from the August 2000 Driver Distraction Internet Forum sponsored by the National Highway Traffic Safety Administration on the World Wide Web)

([6]*Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*- FHWA, Sept. 11, 2001- p. 10
http://www.fhwa.dot.gov///realestate/elecbbrd/elecbbrd.pdf)

Research on driver search behavior in high and low volume intersections by Rahimi, Briggs and Thorn in 1990 suggests that higher volumes of traffic affect driver eye and head movements.[7] The research indicates that the greater visual complexity associated with the high volume intersection required drivers to search the environment more than in the low volume intersections. It can be conjectured that additional visual stimuli, such as billboards, may add additional demand to driver workload in high-volume intersections.[8]

([7]*A Field Evaluation of Driver Eye and Head Movement Strategies toward Environmental Targets and Distractors*
Rahimi, M., Briggs, R. and Thorn, D. [1990]
Applied Ergonomics, 21(4), pp. 267 to 274)

([8]*Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*- FHWA, Sept. 11, 2001- p. 13
http://www.fhwa.dot.gov///realestate/elecbbrd/elecbbrd.pdf)

Guidance on information processing time requirements comes from research on dynamic message signs, where drivers are reading unfamiliar messages. A study (conducted by Mast and Ballas in 1976) was carried out with drivers who were driving on a low-density highway, and it showed that 85 percent of them were able to read signs with word messages only at a rate of one major word per second or better. This means that under perfect conditions, a driver with 20/20 vision traveling during the day at 100 km/h (62 mph) on a freeway reading 14-inch letters has about nine seconds during which the sign text is legible, and therefore could cope with about nine words and/or symbols. At the other extreme, a driver with 20/40 vision traveling at 80 km/h (50 mph) at night on a major highway reading six-inch letters could cope with only one word and/or symbol. Other factors that affect the time taken to read any message are the driver workload (that is, the number of tasks the driver must perform simultaneously), the message familiarity and display format. For driver workload, it is important that the message must be legible at a distance that allows sufficient exposure time for drivers to attend to the complex driving situation and glance at the sign a sufficient number of times to read and comprehend the message.[9]

([9]Toronto Staff Report- Feb. 6, 2001- p. 4
http://www.city.toronto.on.ca/legdocs/2001/agendas/committees/wks/wks010221/it002b.pdf)

Numerous states have attempted to identify a relationship between EBBs and safety by using traffic conditions as a surrogate measure. The states of Nevada, Utah, Texas, New York, New Hampshire and Massachusetts reported no evidence of increased traffic safety problems after the installation of electronic information displays in their city centers and along their highways. Additionally, five state DOT personnel were asked if a crash relationship with EBBs existed in their states; the responses were that a relationship between crashes and EBBs was not identifiable. However, one belief is that EBBs are typically on congested roadways where drivers have time to look at the sign, so it is difficult to determine if the EBBs cause crashes, let alone traffic congestion.[10]

([10]*Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*- FHWA, Sept. 11, 2001- p. 8
http://www.fhwa.dot.gov///realestate/elecbbrd/elecbbrd.pdf)

AVENUES FOR RESEARCH

It would be beneficial to measure the effect that EBBs have on driver distraction. The FHWA report suggests methodologies involving:

The Peripheral Detection Task

Olsson and Burns describe a peripheral detection task (PDT) that is designed to measure visual distraction and driver mental workload. This study included measures of reaction time and correct detection rate for drivers who were asked to report the presence of an LED dot shown briefly at slightly different locations on a windshield while: 1) driving on country roads and a motorway and 2) performing a secondary task while driving. The dots were projected 11 to 23 degrees to the left of the straight-ahead view and two to four degrees above the horizon. This location approximates the visual angle that corresponds to a pedestrian or some roadside signs. Statistically significant results indicated that a CD manipulation task and a backwards counting task required a longer performance time and resulted in fewer correct detections than the baseline driving task.

Since these drivers missed more targets when performing a secondary task and because it took longer to report the targets that were spotted, the PDT may be useful in assessing the distractibility of in-vehicle systems. If the PDT can be applied to in-vehicle systems, it may also be applicable to stimuli external to the vehicle such as EBB and tri-vision signs.[11]

([11]*Measuring Driver Visual Distraction with a Peripheral Detection Task*
Olsson, S. and Burns, P.C. [2000], Obtained from the August 2000 National Highway Traffic Safety Administration Driver Distraction Internet Forum on the World Wide Web)

Work zones

Research about the effects of EBBs in work zones on safety should be performed, since the presence of additional visual distractions may elevate the risk of driver distraction and unsafe driving. Different roadway characteristics exert varying demands upon driver attention and skill. Particular roadway configurations and their characteristics may be more or less suitable for EBBs, and are important to consider when evaluating the safety effects of EBBs. The following roadway characteristics have special considerations relative to the issue of distraction and safety: horizontal and vertical curves, interchanges and intersections, and work zones. Whatever the reason for current selection of improper speed in a work zone, it is possible that the presence of an EBB or tri-vision sign would aggravate the problem.[12]

([12]*Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*- FHWA, Sept. 11, 2001- pp. 21 to 23
http://www.fhwa.dot.gov///realestate/elecbbrd/elecbbrd.pdf)

CMS

Although the CMS is restricted to providing roadway-related information, its legibility requirements may be relevant to the design of the simpler EBB. One event that can be considered a distraction occurs when a driver passes a sign where the text has poor legibility. The weakness in legibility may be due to poor character font design, improper spacing of letters or other factors. However, if the information is of sufficient interest, the driver may try to read all of the text anyway. Such a decision could take time away from the driving task, thus increasing crash risk. If on the other hand the sign had text that met legibility standards, less effort would be required to read the sign. Although this situation is a more subtle distraction than that due to perceived motion in a sign, it still could present potential for crash risk. Garvey and Mace provide draft guidelines for the design of the elements and characters that compose a word and word groupings on a CMS, in which the character font is composed of light emitting elements. [13]

([13]*Changeable Message Sign Visibility*
Garvey, P.M. and Mace, D.J. [1996]
Report No. FHWA-RD-94-077. Washington, D.C: Federal Highway Administration)

The MUTCD (39) Section 2E-21 (applicable to CMS for use on freeway and expressway mainlines), states that a CMS should display no more than three lines of text. There should be a maximum of 20 characters per line. An analysis of these numbers for the simpler EBB displays, in conjunction with analyses of exposure times, may be useful.[14]

([14]*Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*- FHWA, Sept. 11, 2001- pp. 21 to 23
http://www.fhwa.dot.gov///realestate/elecbbrd/elecbbrd.pdf)

Garvey and Mace examined CMSs to identify the features that contribute to their visibility. The authors provide guidelines that are aimed at improving the visibility of all CMSs, regardless of technology. Minimum luminance values are recommended for CMS visibility. In addition, they suggest that there should be a minimum luminous contrast between the unlighted and lighted elements on a CMS. Contrast orientation should always be positive, that is, the characters should be lighted against a dark or less luminous background. A negative contrast is likely to result in a 25 percent shorter legibility distance.[15]

([15]*Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*- FHWA, Sept. 11, 2001- p. 13
http://www.fhwa.dot.gov///realestate/elecbbrd/elecbbrd.pdf)

A TMC pooled-fund study is under way that will assess the impacts of dynamically displaying messages on CMS and recommend updates to the MUTCD regarding design, programming and operation of such applications. The objectives of the research include conducting multitask human factors laboratory studies or studies using a driver simulator to determine the effects of using these dynamic features: flashing an entire one-frame message, flashing one line of a one-frame message, and alternating one line of text and keeping two lines constant on a three-line sign.[16]

([16]*Impacts of Using Dynamic Features to Display Messages on Changeable Message Signs*
TMC Pooled-fund Study- Current Projects
http://tmcpfs.ops.fhwa.dot.gov/cfprojects/new_detail.cfm?id=31&new=0)

Cellular phones

Although research into in-vehicle cellular telephone use does not currently appear to have direct application to EBBs or tri-vision signs, these analyses are ongoing and may still provide insights into the nature of driver distraction, the definition of distraction thresholds and approaches to minimizing distraction for safe driving. In each case, the application of a new technology raised concerns about driver distraction.[17]

([17]*Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*- FHWA, Sept. 11, 2001- p. 29
http://www.fhwa.dot.gov////realestate/elecbbrd/elecbbrd.pdf)

The relevance of information on cellular telephone use to EBBs lies in visual (glancing) and cognitive (mental engagement) behaviors. Viewing EBBs or using a telephone requires drivers to look away from the roadway for some period. Similarly, reading a sign could disrupt a driver's concentration, just as engaging in a telephone conversation might. According to Cain and Burris, hands-free telephone use carries about the same risk observed in hand-held use,[18] and an NHTSA report cites that a telephone conversation is a factor in crashes more frequently than dialing.[19] Cain and Burris believe that the type of conversation is significant in determining crash risk, and McKnight and McKnight believe that complex and intense conversation is the riskiest, and simple conversation is relatively risk-free.[20] Thus, becoming mentally preoccupied can be as distracting to a driver as manually operating a telephone or glancing away from the roadway.[21]

([18]*Investigations of the Use of Mobile Phones While Driving*
Cain, A., and Burris, M. [1999]
Florida, USA: Center for Urban Transportation Research, University of South Florida)

([19]*Traffic Safety Facts 1996: Young Drivers*
National Highway Traffic Safety Administration [1997] Washington, D.C.: National Highway Traffic Safety Administration)

([20]*The Effect of Cellular Phone Use Upon Driver Attention*
McKnight, J., and McKnight, A.S. [1991]
Landover, MD: National Public Services Research Institute)

([21]*Research Review of Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*- FHWA, Sept. 11, 2001- p. 17
http://www.fhwa.dot.gov////realestate/elecbbrd/elecbbrd.pdf)

Regulations – Counties

Ordinance No. 27-D

AN ORDINANCE AMENDING ORDINANCE NO. 27 CARLTON COUNTY ZONING ORDINANCE

The Board of Commissioners of Carlton County ordains as follows:

SECTION I Article 2 Section 2 "Definitions" is amended by adding the following:

51A. Electronic changeable copy sign. A sign or portion thereof that displays electronic, non-pictorial, text information in which each alphanumeric character, graphic, or symbol is defined by a small number of matrix elements using different combinations of light emitting diodes (LED's), fiber optics, light bulbs or other illumination devices within the display area. Electronic changeable copy signs include computer programmable, microprocessor controlled electronic displays.

51B. Electronic graphic display sign. A sign or portion thereof that displays electronic, static images, static graphics or static pictures, with or without information, defined by a small number of matrix elements using different combinations of light emitting diodes (LED's), fiber optics, light bulbs or other illumination devices within the display area where the message change sequence is accomplished immediately or by means of fade, repixalization or dissolve modes. Electronic graphic display signs include computer programmable, microprocessor controlled electronic or digital displays. Electronic graphic display signs include projected images or messages with these characteristics onto buildings or other objects.

51C. Electronic messaging sign. An electronic changeable copy sign, an electronic graphic display sign, or video display sign.

57A. Flashing sign. A directly or indirectly illuminated sign or portion thereof that exhibits changing light or color effect by any means, so as to provide intermittent illumination that changes light intensity in sudden transitory bursts and creates the illusion of intermittent flashing light by streaming, graphic bursts showing movement, or any mode of lighting which resembles zooming, twinkling, or sparkling.

76A. Illuminated sign. Any sign which contains an element designed to emanate artificial light internally or externally.

138A. Shimmering sign. A sign which reflects an oscillating sometimes distorted visual image.

161A. Video display sign. A sign that changes its message or background in a manner or method of display characterized by motion or pictorial imagery, which may or may not include text and depicts action or a special effect to imitate movement, the presentation of pictorials or graphics displayed in a progression of frames which give the illusion of motion, including but not limited to the illusion of moving objects, moving patterns or bands of light, or expanding or contracting shapes, not including electronic changeable copy signs. Video display signs include projected images or messages with these characteristics onto buildings or other objects.

Used with permission.

SECTION II Article 5 Section 16 "Sign Regulations," Subd. A is amended in its entirety to read:

Subd. A. Purpose. This Section is designed to establish a comprehensive and balanced system of sign control that accommodates the need for a well-maintained, safe and attractive environment within the County, and the need for effective communications including business identification. It is the intent of this Section to promote the health, safety, general welfare, and aesthetics of the County by regulating signs that are intended to provide reasonable communication to the public to achieve the following specific purposes:

1. To eliminate potential hazards to motorists and pedestrians using the public streets, sidewalks, and rights-of-way.
2. To safeguard and enhance private investment and property values.
3. To control public nuisances.
4. To protect government investments in public buildings, streets, sidewalks, traffic control and utility devices, parks, and open spaces.
5. To preserve and improve the appearance of the County through adherence to reasonable aesthetic principles, in order to create an environment that is attractive to residents and to non-residents who come to live, visit, work, or trade.
6. To eliminate excessive and confusing sign displays.
7. To implement the County's Comprehensive Plan.
8. To encourage signs which by their design are integrated with and harmonious to the surrounding environment and the buildings and sites they occupy.

SECTION III Article 5 Section 16 "Sign Regulations," Subd. J is amended in its entirety to read:

Subd. J. Lighting. Signs shall not be erected or maintained which contain, include, or are illuminated by any flashing light, electronic change in messages, electronic change in background colors, electronic change in light intensity, or electronic video display, except those giving highway public service information such as lane closures, road closures, and detours, those giving time, date, and temperature, and those as provided in subsection 3. below:

1. Signs shall not be erected or maintained which are not effectively shielded so as to prevent:

   A. beams or rays of light from being directed at any portion of the traveled way of any roadway, or

   B. beams of light of such intensity or brilliance as to cause glare or impair vision of the operator of any motor vehicle.

2. No sign shall be erected or maintained which shall be so placed or illuminated that it interferes with the effectiveness or obscures any official traffic sign, device, or signal, or any official sign such as described Subsection C.3., above.

3. Electronic messaging signs are subject to the following provisions and requirements:

   A. The size and location of the sign shall be consistent with all other requirements of Article 5 Section 16.

   B. The electronic display background color tones, lettering, logos, pictures, illustrations, symbols, and any other electronic graphic or video display shall not blink, flash, rotate, scroll, change in illumination intensity, or otherwise change in outward appearance, except when the electronic message or display is changed to another message or display, and as otherwise provided in Subdivision J.3.

   C. The electronic display background color tones, lettering, logos, pictures, illustrations, symbols, and any other electronic graphic or video display for on-site advertising signs shall not change at intervals less than eight seconds, except that on-site advertising signs twenty (20) square feet or less in area and which are located on roadways posted 45 miles per hour or less speed limit shall be exempt from any intervals between changes in messages.

   D. The electronic display background color tones, lettering, logos, pictures, illustrations, symbols, and any other electronic graphic or video display for off-site advertising signs shall not change at intervals less than eight seconds.

   E. The maximum duration of the transition of the electronic image or message change shall be no more than two seconds.

   F. All electronic messaging signs must be equipped with a default mechanism that will stop the messaging or freeze the image in one position when a malfunction in electronic programming occurs.

   G. Electronic messaging signs must not exceed a maximum illumination of 5000 nits (candelas per square meter) during daylight hours and a maximum illumination of 500 nits (candelas per square meter) between dusk to dawn as measured from the sign's face at maximum brightness.

   H. Electronic messaging signs must have an automatic dimmer control to produce a distinct illumination change from a higher illumination level to a lower level for the time period between one half-hour before sunset and one half-hour after sunrise.

   I. Audio speakers are not allowed with any electronic messaging sign, except as provided in subsection K. below.

   J. Any form of pyrotechnics is prohibited in association with an electronic messaging sign.

   K. Permitted electronic messaging signs, not facing public roads or residential properties and used in drive-through restaurants, gasoline stations, and similar establishments serving motorists, shall be exempt from provisions A.-E. of this subsection provided the electronic messaging sign area does not exceed eight inches

in height or four feet in width or extend more than five feet above the ground. Audio speakers used in connection with signs permitted in this subsection shall not be audible beyond the property on which the sign is located.

SECTION IV Article 5 Section 16 "Sign Regulations," Subd. N is amended by adding:

10. Which includes or displays explosives, fireworks, or any other pyrotechnical devices.
11. Which includes flashing signs except as specifically permitted in Article 5 Section 16.
12. Which includes shimmering signs except as specifically permitted in Article 5 Section 16.
13. Which includes audio devices except as specifically permitted in Article 5 Section 16.
14. Which revolves, pivots, or otherwise moves from a normal stationary or fixed position except as specifically permitted in Article 5 Section 16.

SECTION V This Ordinance shall be in full force and effect after its passage and publication according to law.

Approved and adopted by the Board of Commissioners of Carlton County this 13th day of November, 2007.

_____
Gordon Aanerud, Board Chair

ATTEST:

_____
Paul G. Gassert, County Auditor

Published in the Arrowhead Leader, this _____ day of _____, 2007.

Salt Lake (Utah), County of. 2008. *Code of Ordinances.*
Title 19. Zoning.

Chapter 19.82. Signs.

19.82.020 Definitions.
As used in this chapter:

"Animated sign" means a sign which induces motion or rotation of any part by mechanical, or artificial means, or subdued color changes.

"Electronic message center" means a mechanism or device which uses a combination of lights, or lighted or unlighted panels which are controlled electrically and electronically to produce words, symbols or messages which may flash, travel or scintillate within a given panel area.

"Flashing sign" means a sign which has or appears to have motion or rotation of the lighting elements or displays flashing or intermittent light.

"Illuminated sign" means a sign which has characters, letters, figures, designs or outlines illuminated by electric lights or luminous tubes.

19.82.140 Mobile sign.
One mobile sign may be used for each use for a period of sixty days following the issuance of a permit to construct a permanent sign for that use. Upon inspection and approval of the permanent sign, or upon expiration of the sixty-day period, whichever first occurs, the mobile sign must be removed. Mobile signs may not employ animation, flashing lights or intermittent lights.

19.82.185 Off-premises signs--Billboards.

I. Design. Off-premises signs shall utilize either the "mono-pole" or the "bi-pole" design and shall be continually maintained structurally and on the copy face. The back of the sign and the structure behind the sign shall be painted a dark color. Tri-vision sign faces shall be permitted and, if illuminated, must be externally illuminated. Internally illuminated off-premises signs, electronic display (outdoor video advertising) and electronic message centers are only allowed adjacent to the interstate freeway system and limited to no more than one change to the copy face in a twenty-four hour period. Two-decked off-premises signs are prohibited in all zones.

19.82.190 On-premises signs allowed in zoning districts.
On-premises signs allowed, by zones, shall be as set out in Table 19.82.190.

Table 19.82.190

SIGNS ALLOWED, BY ZONES

ZONE	SIGN	SIZE	HEIGHT	LOCATION	OTHER
(4) C-2, C-3	C-2 Ground or projecting on-premises	48 sq. ft. plus 1 sq. ft. for each foot of frontage over 30 on a street to a maximum of 256 sq. ft. Property abutting a freeway with no frontage on a dedicated street may have one sign as a conditional use located within 30 ft. of the freeway not to exceed 256 sq. ft. and the height shall not exceed 25 ft. above freeway grade. A property having frontage on a dedicated street which connects directly to an on or off ramp of I-15 and is within 600 ft. of the main traveled way of I-15 may have one sign up to 60 ft. high, but not to exceed 25 ft. above freeway grade level and 400 sq. ft.	30 ft. max.	18-inch setback, 1 sign per 300 ft. frontage or part thereof	Illumination may be built into or attached to signs unless exposed to a dwelling on adjacent property or a residential zone boundary in which case it may be allowed with conditional use approval. Rotation and subdued light change may be allowed with conditional use approval. Electronic message center signs are conditional use
	C-3 Ground or projecting on-premises	48 sq. ft. plus 11/2 sq. ft. for each foot of frontage over 30 on a street to a maximum	30 ft. max.	No setback required, 1 sign per 300 ft. frontage or part	Illumination may be built into or attached to signs unless exposed to a dwelling on adjacent property

		of 300 sq. ft. Property abutting a freeway with no frontage on a dedicated street may have one sign as a conditional use located within 30 ft. of the freeway not to exceed 300 sq. ft. and the height shall not exceed 25 ft. above freeway grade. A property having frontage on a dedicated street which connects directly to an on or off ramp of I-15 and is within 600 ft. of the main traveled way of I-15 may have one sign up to 60 ft. high, but not to exceed 25 ft. above freeway grade level and 400 sq. ft.		thereof	or a residential zone boundary in which case it may be allowed with conditional use approval. Rotation and subdued light change may be allowed with conditional use approval. Electronic message center signs are permitted use
(5) M-1, M-2	Ground or projecting on-premises	48 sq. ft. plus 1 sq. ft. for each foot of frontage over 30 on a street to a maximum of 256 sq. ft. A property having frontage on a dedicated street which connects directly to an on or off ramp of I-15 and is within 600 ft. of the main traveled way of I-15 may	35. ft. max.	15 ft. setback, 1 sign per 300 ft. frontage or part thereof	Illumination may be built into or attached to sign. Electronic message center signs are permitted uses

		have one sign up to 60 ft. high, but not to exceed 25 ft. above freeway grade level and 400 sq. ft.			

Municipalities – Population Over 100,000

Arlington (Texas), City of. 2007. *Code of Ordinances.*

Article XVI. Sign Standards.

Section 16-300 Definitions

Electronic Message Center Sign: A sign displaying public service information, any similar public interest information, information about events (including pre-event and post-event entertainment) on the premises and/or related advertising for a general business located on the same premises (including a product, service or company offering goods or services on the premises or having a promotional relationship for events occurring on the premises, including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors) through electronically controlled intermittent light pulses or other technology that can display, emit or project (or is readily capable of displaying, emitting or projecting) animated or video images. (Amend Ord 05-048, 6/28/05)

Flashing: Operation which creates flashing light, changes in light intensity, colors or copy, or intermittent light impulses. Electronic Message Centers, as defined in Subsection 16-300(L), and a sign which creates intermittent light impulses which only conveys the time of day and/or temperature shall not constitute a flashing sign for the purposes of this ordinance. (Amend Ord 98-148, 11/17/98)

Gasoline Price Sign: An outdoor advertising display with changeable copy letters and numerals or an electronic display without movement affixed to a gasoline pump canopy or its supports and intended to have a change of message no more frequently than once a day that displays the current price of diesel fuel or gasoline for sale.

Motion: The moving or rotating of a sign or portion thereof, or the giving of the perception of motion, other than a message center as hereinafter defined.

Reader Board: A changeable copy sign with strips attached to the face of the sign to hold removable displays, letters and numerals for the purpose of identifying products sold or services provided by the related business tenant on the same premises. An electronic display without movement and intended to have a change of message no more frequently than once a day may be considered a reader board.

Section 16-500 Prohibited Signs

H. Signs which have motion are prohibited.

Section 16-800 Sign Illumination

A. Signs may be illuminated as provided by this ordinance and specified by approved sign criteria, if applicable, in accordance with the following regulations:

1. Externally illuminated signs may be illuminated by either ground-mounted lights or wall-mounted light bars. Except for overhanging arms, the mechanical parts of the light source shall not be permitted for supporting lighting fixtures and shall be shielded from view.

Used with permission.

2. Internal illuminated signs when permitted, shall be lighted so that at a distance of 10', the light intensity does not exceed 11,000 lumens.

3. Flashing or intermittent forms of illumination are prohibited.

Section 16-2200 Electronic Message Center

A. **Arterials and limited access freeways:**

1. **Permitted construction**

GROUND SIGN, POLE SIGN OR WALL SIGN

Maximum square footage and height: The size and height of electronic message centers are regulated by limitations placed on business signs for the street on which they are placed. Electronic message center signs shall in no case exceed 50 square feet when used as a wall sign.

Setback: Ten feet from interior side lot lines

Lighting: Internal or External

2. Changeable Messages are allowed as follows:

a. Text messages on an electronic message center, including a sign which conveys the time of day and/or temperature only, located on an arterial street, must continuously display the message at least two seconds. A single message shown in segments shall not exceed an eight-second duration.

b. Text messages on an electronic message center, including a sign which conveys the time of day and/or temperature only, located on a limited access freeway, must continuously display the message at least eight seconds.

c. No scrolling message is permitted.

d. Letter height shall be based on sight distance of one inch of height per 36 feet of sight distance, providing a minimum ten-inch letter height on an arterial street and minimum 18-inch letter height on limited access freeway.

(1) Minimum sight distance shall be determined by reference to the American Association of State Highway and Transportation Officials (AASHTO) manual.

(2) Vehicle speed shall be determined by posted speed limit plus five MPH.

Time limit: None.

3. **Special Conditions**

a. A special exception is required for any electronic message center sign displaying animated or video images, except when located in the "F"

(Festival) district or signs authorized by Section 16-2500, Major Sports Complex Sign Standards.

b. If electronic message center signs are freestanding no other freestanding general business signs are permitted.

c. All electronic message centers, including a sign which conveys the time of day and/or temperature only, lawfully in existence on August 8, 2006, or permitted after the adoption of this ordinance, shall conform to the changeable message requirements of Section 16-2200 (A)(2).

B. **Collectors**: Not permitted.

C. **Local Streets**: Not permitted.
(Amend Ord 06-077, 8/22/06)

Section 16-2500 Major Sports Complex Sign Standards.

A. **Applicability, Interpretations and Exemptions.**

1. **Applicability.** The requirements of this Section and Section 9.02 of the "Streets" Chapter of the Code of the City of Arlington, shall apply to all signs visible from a public street or adjacent property within a major sports complex, except as otherwise provided herein. This includes restrictions regarding obstructions to view. The special regulations contained in this Section are the exclusive requirements and limitations under this Chapter for major sports complex signs and shall supersede all other requirements and limitations of this Chapter (including Section 16-2100). This Section is solely applicable to major sports complex signs.

2. **Main Facility.** The term "main facility" with respect to a major sports complex means a facility designed to seat at least 40,000 spectators for professional or amateur sports events.

3. **Exemptions.** All signs within a major sports complex that are not visible from a public street or adjacent property shall be exempt from all requirements and limitations of this Chapter. Any scoreboard, sign or video screen that is located in, on or around a main facility (extending to the more expansive of (a) the admission perimeter, (b) the drip line of such main facility or (c) on-site pedestrian pathways adjacent to and contiguous with such main facility, whether or not visible from a public street or adjacent property) of a major sports complex shall be exempt from all requirements and limitations of this Chapter. Notwithstanding the foregoing, signs that are visible from a public street or adjacent property and that are attached to the exterior (not including any field side) of a main facility designed to (i) seat at least 40,000 spectators but less than 70,000 spectators and (ii) house major league baseball games shall be subject to the requirements and limitations of Subsection 16-2500(N). Additionally, any permanent video screen that (a) is located within a major sports complex, (b) is not oriented toward a public street and (c) may only be incidentally visible from a public street shall be exempt from the requirements and limitations of this Chapter. No special

exception shall be required for electronic message center signs permitted under this Section.

4. **Promotional Relationship.** Any sign authorized by this Section that directs attention, directly or indirectly, to any of the following promotional relationships with either a major sports complex or the person or entity holding or owning, from time to time, the legal possessory right or interest to use or occupy a main facility shall not be considered "off premise" advertising: events (including pre-event and post-event entertainment), products, services and companies located within a major sports complex and products, services and companies having a promotional relationship for teams at a main facility or events occurring within a major sports complex (including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors).

5. **Permits.** No permit under Article VII of the "Construction" Chapter of the Code of the City of Arlington shall be required for any of the following where located within a major sports complex: primary and decorative flags and vertical banners, air balloons, temporary special events banners and temporary video screens.

6. **Maintenance.** All signs authorized by this Section, together with all their supports, braces, guys and anchors, shall be kept in good repair and proper working condition subject to normal wear and tear.

C. **Pole Signs.**
Permissible Location: On-Site – Only as specifically authorized under "Special Conditions". Off-Site – Only (i) as specifically authorized under "Special Conditions" and (ii) at any location with a Specific Use Permit
Maximum area: 700 square feet. Where an electronic message center sign is provided, the maximum permitted area shall be increased to 1,200 square feet.
Maximum height: 80 feet; except signs that are within 660 feet of and visible from the main travel lanes of a controlled access freeway shall not exceed 42.5 feet in height above the higher surface elevation of the nearest frontage road or main travel lane.
Lighting: Internal or External
Permitted in right-of-way: Yes, in accordance with a right-of-way use agreement approved by the City Manager and City Attorney.
Time Limit: None
Special Conditions:

i. Each pole sign authorized under this Section shall be separated by not less than 625 feet from any other pole sign authorized under this Section.

ii. Each main facility of a major sports complex is authorized to place a total of six pole signs in the City in any of the following locations: (a) within a major sports complex; (b) fronting arterial streets identified as a primary route for ingress or egress for a major sports complex (provided, however, no such sign shall front East Lamar Boulevard between Ascension Boulevard and Brookhollow Plaza Drive); and (c) located in the vicinity of Interstate Highway 20 at its intersection with State Highway 360, as shown more particularly on Exhibit "B" attached to this ordinance and incorporated herein for all purposes. If located within 660 feet of a controlled

access freeway, such signs shall not be placed outside a commercial or industrial zone.

iii. In addition to the above, a main facility designed to seat at least 70,000 spectators is authorized to place one pole sign on a lot with frontage on Interstate Highway 30. Such sign may be located within or outside a major sports complex and may be located within 660 feet of a controlled access freeway. Additionally, such sign shall not be placed either (a) outside a commercial or industrial zone or (b) within 100 feet of any residential zone outside a major sports complex.

iv. In addition to the above, the pole sign fronting Interstate Highway 30 for the main facility used as a major league baseball park shall be permitted as a pole sign authorized under this Subsection, provided such sign complies with the requirements and limitations of this Subsection.

v. In addition to the above, all main facilities in the City are authorized to collectively place up to two pole signs on lots with frontage on Interstate Highway 30 and one pole sign on a lot with frontage on State Highway 360. Such signs may be located within or outside a major sports complex and may be located within 660 feet of a controlled access freeway. Additionally, such signs shall not be placed either (a) outside a commercial or industrial zone or (b) within 100 feet of any residential zone outside a major sports complex.

vi. Electronic message center signs shall be permitted on all pole signs authorized under this Section.

vii. Sponsor panels for products, services and companies located within a major sports complex and products, services and companies having a promotional relationship with teams at a main facility or events (including pre-event and post-event entertainment) occurring within a major sports complex (including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors) shall be permitted on all pole signs authorized under this Section. A sponsor panel must be removed if the sponsor product, service or company ceases to be located within the major sports complex and/or all applicable promotional relationships (with respect to such sponsor panel) with teams at a main facility or events occurring within the major sports complex end.

viii. Sponsor panels may be located on any portion or all of each permitted on-site pole sign. Sponsor panels may be located on any portion of each permitted off-site pole sign, subject to the following limitations: (a) if less than the entire display area is an electronic message center sign, then no more than 35% of the total display area may be used for sponsor panels; and (b) if the entire display area is an electronic message center sign, then no more than 35% of each half-hour period during which messages are displayed may be used for the display of products, services and companies located within a major sports complex or having a promotional relationship for events occurring within a major sports complex (provided, however, at any time, permitted pole signs may depict any or all of the following: the theme of a major sports complex, the name of a main facility, the name of a parking area, the name of a location within a major sports complex, an event to occur at a main facility, one or more professional or amateur sports teams that play at a main facility and the location of Arlington, Texas).

ix. Reader boards may be incorporated into permitted pole signs, provided the combined area of reader boards for any one sign does not exceed 75% of such sign's display area.

x. Each pole sign may contain multiple display areas on multiple sides or all sides. The combined area of the pole sign shall be measured by summing the individual rectangle(s) enclosing each display area, exclusive of the pole(s). For spherical, free-form, sculptural and other non-planar signs, the sign area shall be the sum of the areas using only the four vertical sides of the smallest hexahedron that will encompass the sign. Where there is more than one side to a pole sign, the total allowable area shall be doubled and the area may be distributed among the various sides, with no single side exceeding the original allowable area.

D. **Ground Signs.**
Permissible Location: On-Site – Yes. Off-Site – No
Maximum area: 400 square feet.
Maximum height: 24 feet.
Lighting: Internal or External
Permitted in right-of-way: Yes, in accordance with a right-of-way use agreement approved by the City Manager and City Attorney.
Time Limit: None
Special Conditions:

i. One ground sign is permitted for each 200 lineal feet of street frontage or portion thereof within a major sports complex. Each ground sign must be separated by not less than 150 feet.

ii. Electronic message center signs and reader boards shall be permitted on ground signs.

iii. Sponsor panels for products, services and companies located within a major sports complex and products, services and companies having a promotional relationship with teams at a main facility or events (including pre-event and post-event entertainment) occurring within a major sports complex (including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors) shall be permitted on ground signs. A sponsor panel must be removed if the sponsor product, service or company ceases to be located within the major sports complex and/or all applicable promotional relationships (with respect to such sponsor panel) with teams at a main facility or events occurring within the major sports complex end.

iv. Sponsor panels may be located on any portion of each permitted ground sign, subject to the following limitations: (a) if less than the entire display area is an electronic message center sign, then no more than 90% of the total display area may be used for sponsor panels; and (b) if the entire display area is an electronic message center sign, then no more than 90% of each half-hour period during which messages are displayed may be used for the display of products, services and companies located within a major sports complex or having a promotional relationship for events occurring within a major sports complex (provided, however, at any time, permitted ground signs may depict any or all of the following: the theme of a major sports complex, the name of a main facility, the name of a parking area, the name of a location within a major sports complex, an event to occur at a

main facility, one or more professional or amateur sports teams that play at a main facility and the location of Arlington, Texas).

v. Each ground sign may contain multiple display areas on multiple sides or all sides. The combined area of the ground sign shall be measured by summing the individual display areas. For spherical, free-form, sculptural and other non-planar signs, the sign area shall be the sum of the areas using only the four vertical sides of the smallest hexahedron that will encompass the sign. Where there is more than one side to a ground sign, the total allowable area shall be doubled and the area may be distributed among the various sides, with no single side exceeding the original allowable area.

E. **Directional and Site Circulation Signs.**
Permissible Location: On-Site – No. Off-Site – Only (i) as specifically authorized under "Special Conditions" and (ii) at any location with a Specific Use Permit
Maximum area: 400 square feet.
Maximum height: 24 feet.
Lighting: Internal or External
Permitted in right-of-way: Yes, in accordance with a right-of-way use agreement approved by the City Manager and City Attorney.
Time Limit: None
Special Conditions:

i. Directional and site circulation signs that are related to a major sports complex and owned or controlled, from time to time, by the person or entity holding or owning the legal possessory right or interest to use or occupy a main facility of a major sports complex shall be permitted where fronting arterial streets identified as a primary route for ingress or egress for a major sports complex.

ii. One directional or site circulation sign shall be permitted for each 250 lineal feet of street frontage or portion thereof (provided however, no more than six such signs shall be permitted to front East Lamar Boulevard between Ascension Boulevard and Brookhollow Plaza Drive). Each such sign must be separated by not less than 250 feet.

iii. Directional and site circulation signs may be any type of sign.

iv. Electronic message center signs and reader boards shall be permitted on directional and site circulation signs.

v. Sponsor panels for products, services and companies located within a major sports complex and products, services and companies having a promotional relationship with teams at a main facility or events (including pre-event and post-event entertainment) occurring within a major sports complex (including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors) shall be permitted on directional and site circulation signs. A sponsor panel must be removed if the sponsor product, service or company ceases to be located within the major sports complex and/or all applicable promotional relationships (with respect to such sponsor panel) with teams at a main facility or events occurring within the major sports complex end.

vi. Sponsor panels may be located on any portion of each permitted directional and site circulation sign, subject to the following limitations: (a) if less than the

entire display area is an electronic message center sign, then no more than 35% of the total display area may be used for sponsor panels; and (b) if the entire display area is an electronic message center sign, then no more than 35% of each half-hour period during which messages are displayed may be used for the display of products, services and companies located within a major sports complex or having a promotional relationship for events occurring within a major sports complex (provided, however, at any time, permitted directional and site circulation signs may depict any or all of the following: the theme of a major sports complex, the name of a main facility, the name of a parking area, the name of a location within a major sports complex, an event to occur at a main facility, one or more professional or amateur sports teams that play at a main facility and the location of Arlington, Texas).

vii. Each directional and site circulation sign may contain multiple display areas on multiple sides or all sides. The combined area of such signs shall be measured by summing the individual display areas. For spherical, free-form, sculptural and other non-planar signs, the sign area shall be the sum of the areas using only the four vertical sides of the smallest hexahedron that will encompass the sign. Where there is more than one side to a ground sign, the total allowable area shall be doubled and the area may be distributed among the various sides, with no single side exceeding the original allowable area.

F. **Wall Signs.**
Permissible Location: On-Site – Yes. Off-Site – No
Maximum area: 70% of wall area (including exempt wall signs at the main facility).
Lighting : Internal or External
Permitted in right-of-way: n/a.
Time limit: None
Special Conditions:

i. No wall sign shall (1) extend horizontally more than 18 inches from the wall to which it is attached, (2) extend vertically above the height of the parapet of the wall to which it is attached (unless contiguous with a roof sign permitted under this Section) and (3) extend vertically below 10 feet above the height of the finished sidewalk along the adjacent right-of-way or pedestrian pathway (except that signs that do not exceed 65 square feet in size are exempt from this requirement, provided there is a separation between such signs of at least 50 linear feet along the adjacent right-of-way or pathway).

ii. Electronic message center signs and reader boards shall be permitted on wall signs.

iii. Wall murals shall be permitted as wall signs and may be sponsor panels.

iv. Sponsor panels for products, services and companies located within a major sports complex and products, services and companies having a promotional relationship with teams at a main facility or events (including pre-event and post-event entertainment) occurring within a major sports complex (including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors) shall be permitted on wall signs, and may be located on any portion or all of each wall sign. A sponsor panel must be removed if the sponsor product, service or company ceases to be located within the major sports complex and/or all

applicable promotional relationships (with respect to such sponsor panel) with teams at a main facility or events occurring within the major sports complex end.

G. **Stadium Entrance Gate and Parking Lot Entrance Signs.**
Permissible Location: On-Site – Yes. Off-Site – No
Maximum area: 450 square feet each.
Maximum height: 60 feet
Lighting: Internal or External
Permitted in right-of-way: Yes, in accordance with a right-of-way use agreement approved by the City Manager and City Attorney.
Time limit: None
Special Conditions:

i. Up to three signs per entrance gate of each main facility and per each entrance to a parking area owned or controlled, from time to time, by the person or entity holding or owning the legal possessory right or interest to use or occupy a main facility of a major sports complex (whether directly, or indirectly through one or more intermediaries, affiliates, parents or subsidiaries, including any combination thereof and any successors and assigns thereof) shall be permitted; no minimum spacing.

ii. Electronic message center signs and reader boards shall be permitted on stadium entrance gate signs and parking lot entrance signs.

iii. Stadium entrance gate signs and parking lot entrance signs may be any type of sign.

iv. Sponsor panels for products, services and companies located within a major sports complex and products, services and companies having a promotional relationship with teams at a main facility or events (including pre-event and post-event entertainment) occurring within a major sports complex (including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors) and off-premise advertising shall be permitted on stadium entrance gate signs and parking lot entrance signs, and may be located on any portion or all of each such sign. A sponsor panel must be removed if the sponsor product, service or company ceases to be located within the major sports complex and/or all applicable promotional relationships (with respect to such sponsor panel) with teams at a main facility or events occurring within the major sports complex end.

v. Each stadium entrance gate sign and parking lot entrance sign may contain multiple display areas on multiple sides or all sides. The combined area of the sign shall be measured by summing the individual rectangle(s) enclosing each display area, exclusive of any pole(s). For spherical, free-form, sculptural and other non-planar signs, the sign area shall be the sum of the areas using only the four vertical sides of the smallest hexahedron that will encompass the sign. Where there is more than one side to a sign, the total allowable area shall be doubled and the area may be distributed among the various sides, with no single side exceeding the original allowable area.

H. **Major Site Identity Signs.**

Permissible Location On-Site – Yes. Off-Site – Only (i) as specifically authorized under "Special Conditions" and (ii) at any location with a Specific Use Permit
Maximum height: 100 feet.
Maximum width: 60 feet.
Maximum area: 12,000 sq. ft.
Lighting: Internal or External
Permitted in right-of-way: Yes, in accordance with a right-of-way use agreement approved by the City Manager and City Attorney.
Time limit: None
Special Conditions:

i. Each major site identity sign authorized under this Section shall be separated by not less than 625 feet from any other major site identity sign authorized under this Section.

ii. Each main facility of a major sports complex is authorized to place a total of six major site identity signs in the City in any of the following locations: (a) within a major sports complex; (b) fronting arterial streets identified as a primary route for ingress or egress for a major sports complex (provided, however, no such sign shall front East Lamar Boulevard between Ascension Boulevard and Brookhollow Plaza Drive); and (c) located in the vicinity of Interstate Highway 20 at its intersection with State Highway 360, as shown more particularly on Exhibit "B" attached to this ordinance and incorporated herein for all purposes. If located within 660 feet of a controlled access freeway, such signs shall not be placed outside a commercial or industrial zone.

iii. Each major site identity sign shall be some form of ground-based pylon.

iv. Electronic message center signs shall be permitted on major site identity signs.

v. Each major site identity sign may contain multiple display areas on multiple sides or all sides.

vi. Reader boards may be incorporated into permitted major site identity signs, provided the combined area of reader boards for any one sign does not exceed 25% of such sign's area.

vii. Sponsor panels for products, services and companies located within a major sports complex and products, services and companies having a promotional relationship with teams at a main facility or events (including pre-event and post-event entertainment) occurring within a major sports complex (including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors) shall be permitted on all major site identity signs authorized under this Section. A sponsor panel must be removed if the sponsor product, service or company ceases to be located within the major sports complex and/or all applicable promotional relationships (with respect to such sponsor panel) with teams at a main facility or events occurring within the major sports complex end.

viii. Sponsor panels may be located on any portion or all of each permitted on-site major site identity sign. Sponsor panels may be located on any portion of each permitted off-site major site identity sign, subject to the following limitations: (a) if less than the entire display area is an electronic message center sign, then no more than 35% of the total display area may be used for sponsor panels; and (b) if the

entire display area is an electronic message center sign, then no more than 35% of each half-hour period during which messages are displayed may be used for the display of products, services and companies located within a major sports complex or having a promotional relationship for events occurring within a major sports complex (provided, however, at any time, permitted major site identity signs may depict any or all of the following: the theme of a major sports complex, the name of a main facility, the name of a parking area, the name of a location within a major sports complex, an event to occur at a main facility, one or more professional or amateur sports teams that play at a main facility and the location of Arlington, Texas).

ix. The combined area of each major site identity sign shall be measured by summing the entire area of all sides of the sign. For spherical, free-form, sculptural and other non-planar signs, the sign area shall be the sum of the areas using only the four vertical sides of the smallest hexahedron that will encompass the sign.

I. **Roof Signs.**
Permissible Location: On-Site – Yes. Off-Site – No
Maximum area: 6,500 square feet.
Maximum height: 60 feet above the roof of the building to which it is attached.
Lighting: Internal or External
Permitted in right-of-way: n/a
Time limit: None
Special Conditions:

i. Up to a total of six roof signs per main facility may be attached to any structure within a major sports complex. Signs that are either exempt under Subsection 16-2500(A)(3) or regulated under Subsection 16-2500(N) shall not be included in the six (6) signs authorized above.

ii. Each roof sign shall not extend more than 18 inches beyond the front of any elevation of the building to which it is attached.

iii. Roof signs located within 660 feet of the right-of-way of a controlled access freeway are permissible, provided such signs are (a) not oriented toward a controlled access freeway and (b) either not visible from or only incidentally visible from the main travel lanes of a controlled access freeway.

iv. Each roof sign may contain multiple display areas on multiple sides or all sides.

v. Electronic message center signs and reader boards shall be permitted on roof signs.

vi. The combined area of each roof sign shall be measured by summing the entire area of all sides of the sign. For spherical, free-form, sculptural and other non-planar signs, the sign area shall be the sum of the areas using only the four vertical sides of the smallest hexahedron that will encompass the sign.

vii. Roof murals that are not visible from the ground shall be permitted without area limitation, as roof signs.

viii. Sponsor panels for products, services and companies located within a major sports complex and products, services and companies having a promotional

relationship with teams at a main facility or events (including pre-event and post-event entertainment) occurring within a major sports complex (including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors) shall be permitted on roof signs, and may be located on any portion or all of each roof sign. A sponsor panel must be removed if the sponsor product, service or company ceases to be located within the major sports complex and/or all applicable promotional relationships (with respect to such sponsor panel) with teams at a main facility or events occurring within the major sports complex end.

J. **Arcade Signs.**
Permissible Location: On-Site – Yes. Off-Site – No
Maximum area: 60 square feet.
Maximum height: 3 feet.
Maximum width: 20 feet.
Minimum vertical clearance: 8 feet from the floor to the bottom of sign.
Lighting: Internal or External
Permitted in right-of-way: n/a
Time Limit: None
Special Conditions:

i. Arcade signs shall be (a) either suspended from the ceiling of or projected from a wall of a roofed-passageway that has retail uses on at least one side and (b) located completely within the outside limits of the structural surfaces that delineate such passageway.

ii. One arcade sign shall be permitted for each entrance.

iii. Electronic message center signs and reader boards shall be permitted on arcade signs.

iv. Each arcade sign shall not have more than two parallel display sides. The area of an arcade sign shall be calculated using the area of the largest display side.

v. Sponsor panels for products, services and companies located within a major sports complex and products, services and companies having a promotional relationship with teams at a main facility or events (including pre-event and post-event entertainment) occurring within a major sports complex (including, but not limited to, naming rights holders, multiple event sponsors and individual event sponsors) shall be permitted on arcade signs, and may be located on any portion or all of each arcade sign. A sponsor panel must be removed if the sponsor product, service or company ceases to be located within the major sports complex and/or all applicable promotional relationships (with respect to such sponsor panel) with teams at a main facility or events occurring within the major sports complex end.

M. **Temporary Video Screens.**
Permissible Location: On-Site – Yes. Off-Site – No
Maximum area: 3,500 square feet.
Maximum height: None
Lighting: Internal or External
Spacing: No limit

Permitted in right-of-way: No.
Time limit: Sixty (60) consecutive days for each special event.
Special Conditions:

i. Temporary video screen units meeting the requirements of this subsection are allowed at a major sports complex.

ii. Sponsor panels and off-premise advertising are allowed on temporary video screens. Sponsor panels and off-premise advertising may be located on any portion or all of a temporary video screen and shall not be required to be part of a temporary video screen.

iii. Temporary video screens shall not be oriented toward any publicly dedicated street and may only incidentally be visible from any publicly dedicated street.

6. **Roof Signs.**
Permissible location: at or above the roof line.
Maximum area: 6,500 sq. ft.
Maximum height: 30 feet above the roof of the main facility.
Maximum Number: four total, with no more than one per side of the main facility.

(e) Electronic message center signs and reader boards shall not be permitted.
(f) Roof murals that are not visible from the ground shall be permitted without area limitation, as roof signs.
(g) Sponsor panels displaying the name and logo of any and all of the following may be located on any portion or all of each roof sign: (a) the name of the main facility, (b) the name of a naming rights holder and (c) the logo of a naming rights holder. (Amend Ord 05-048, 6/28/05)

ARTICLE 2

DEFINITIONS*

*Note: For definitions applicable to Neighborhood Districts and to Article 80, see Article 2A.

SECTION 2-1. **Meaning of Certain Words and Phrases.** As used in this code, the following words and phrases shall have the meanings given in the following clauses, unless a contrary intention clearly appears:

(1) "Accessory building", a structure devoted exclusively to a use accessory to a main use of the lot.

(2) "Accessory use", a use customarily incident to, and on the same lot as, a main use.

^(2AA) "Airport-related remote parking facility," a parking lot or parking garage from which transportation service is offered to airport premises.

(^As inserted on November 21, 1996.)

^(2A) "Amusement game machine", a machine, apparatus, device, or mechanism, by which entertainment requiring or involving participation therein or the use of skill therein by a player or patron is furnished for profit, including, but not exclusively, video games and pinball machines, and excluding pool tables, sippio tables, billiard tables, and bowling alleys. An amusement game machine may be, but need not be, controlled by a coin, token, or slug.

(^As inserted on June 2, 1983)

(3) "Apartment hotel", a building primarily for persons who have their residence therein, containing four or more apartments which do not have kitchens.

^(3A) "Art use", the creation, manufacture, or assemblage of visual art, including two- or three-dimensional works of fine art or craft, or other fine art objects created, manufactured, or assembled for the purpose of sale, display, commission, consignment, or trade by artists or artisans; or classes held for art instruction.

(^As inserted on February 1, 1989)

Used with permission of the Boston Redevelopment Authority.

^(38C) "School", buildings, premises and parts thereof in which a regular course of public or private instruction is given.

(^As inserted on April 11, 1979)

(39) "Shall", shall be considered mandatory and not directory.

^(40) "Sign", any structure, device, light, letter, word, model, banner, pennant, insignia, trade flag, or representation which is designed to be seen from outside a building and which advertises or announces a use conducted or goods, products, services or facilities available, including electric signs in windows or doors, but excluding window displays of merchandise and signs incidental to the display of merchandise.

(^As amended on December 18, 1972)

(41) "Sign, area of":

(a) For a sign, either free-standing or attached, the area shall be considered to include all lettering, wording, and accompanying designs and symbols, together with the background, whether open or enclosed, on which they are displayed, but not including any supporting framework and bracing which are incidental to the display itself.

(b) For a sign painted upon or applied to a building, the area shall be considered to include all lettering, wording and accompanying designs or symbols together with any background of a different color than the natural color of the building.

^(c) Where the sign consists of individual letters or symbols attached to or painted on a surface, building, canopy, awning, wall or window, the area shall be considered to be that of the smallest rectangle or other geometric shape which encompasses all of the letters or symbols.

(^As amended on December 18, 1972)

^(d) Only one face of a two-faced sign shall be counted in computing the area of a sign, or the total area of signs on a sign frontage or on a lot.

(^As inserted on December 18, 1972, and amended on June 7, 1974)

^(41A) "Sign, awning", a sign on or attached to a temporary retractable shelter which is supported entirely from the exterior wall of a building.

^(41B) "Sign, canopy", a sign on or attached to a permanent overhanging shelter which projects from the face of a building and is supported only partially by said building.

^(41C) "Sign design, comprehensive", a plan submitted to the Urban Design Department of the Boston Redevelopment Authority for signs and related architectural features on a sign frontage, a building front or a group of buildings.

^(41CC) "Sign, electronic", an on-premise sign that allows for periodic changes in copy, images and/or symbols by electronic means.

(^As inserted on April 25, 2007)

^(41D) "Sign frontage", the length along a ground floor building front, facing a street or a private way accessible from a street, which is occupied by a separate and distinct use, as defined by Article 8; the length along a ground floor building side facing a street, which is occupied by a separate and distinct use or by the same use which occupies the front of said building.

(^As inserted on April 11, 1973)

^(41E) "Sign, marquee", a sign on or attached to a permanent overhanging shelter which projects from the face of a building and is entirely supported by said building.

(^As inserted on April 11, 1973)

^(41F) "Sign, off-premise", a sign which advertises or announces a use conducted or goods available elsewhere than on the lot on which the sign is located.

(^As inserted on April 11, 1973)

^(41G) "Sign, on-premise", a sign which advertises or announces a use conducted or goods available on the lot on which the sign is located.

(^As inserted on April 11, 1973)

^(41H) "Small Project Review", the review described in Section 80E-1.

(^As inserted on May 9, 1996)

^ARTICLE 11

SIGNS
(^Article inserted on December 18, 1972)

SECTION 11-1. **Signs in Residential Districts.** In any residential district there shall not be any sign except as follows:

(a) One sign, not exceeding two square feet in total area, attached to the building or on a rod or post not more than four feet high and at least three feet in from the street line, and stating only the street number or name of the occupant or occupants of the lot, or both, except that in an H district such sign may also identify the business of a professional person, as defined by Use Item No. 39 of Section 8-7.

(b) One bulletin or announcement board, name sign or entrance marker for each church or institution not exceeding twenty square feet in area, except that if the street frontage of such church or institution exceeds one hundred feet, one such sign for each hundred feet computed to the nearest hundred but in no event more than three such signs for each church or institution.

(c) One "For Sale" or "For Rent" sign, not exceeding eight square feet in area, advertising the property on which such sign is located.

(d) One building contractor's or developer's sign, not exceeding thirty-two square feet in total area, on a lot where a building is actually under construction.

(e) One sign not exceeding twenty square feet per entrance to a tract of land divided into building lots.

^(f) One sign, accessory to a nonconforming use, which conforms with Section 11-2, provided, however, that the area of said sign does not exceed one-half of the area allowed in non-residential districts under said section.

(^As inserted on April 11, 1973)

^(g) Official public notices and notices posted by public officers in performance of their duties.

the lot in the S, R or H district shall not exceed whichever of the following allows the greater area:

(1) 10% of the area of the wall substantially parallel to such lot line, or

(2) one square foot for each foot in the length of such lot line; and

(b) no new billboards shall be allowed within six hundred sixty (660) feet of a federally-funded highway subject to the Federal Highway Beautification Act unless approved by the Board of Appeal in accordance with Article 6 after receipt by the Board of Appeal of a planning recommendation from the Boston Redevelopment Authority.

(^As amended April 11, 1973, August 30, 1988, February 1, 1989, April 27, 1990, and September 30, 1993)

^Section 11-7. **Electronic Signs**. Electronic signs shall be conditional uses in the Theater District, Lansdowne Street Entertainment District and the Seaport Convention Center District, as shown on Appendix A. Within the above mentioned areas, all electronic signage is forbidden within one hundred and fifty (150') feet of a residential zoning district. Electronic signs are forbidden elsewhere in the city.

1. The Board of Appeal shall grant a conditional use permit for an Electronic Sign, subject to the provisions of Article 6, only if the electronic sign:

   (a) has been subject to design review approval by the Authority;
   (b) is limited to a five (5) year time period at which time, upon timely and proper appeal, the Board may renew the permit for an additional period of five (5) years, provided the sign was operated in compliance with the provisions of the conditional use in all material respects;
   (c) does not project more than five (5') feet from the face of a building or the width of the sidewalk, whichever is less;
   (e) is limited to hours of operation between 7:00 AM and 2:00 AM; and
   (f) has a luminance at night that does not exceed 500 cd/m_2

2. An electronic sign may be found, by ISD, to be in violation of the terms of its conditional use permit if the Authority finds one or more of the following:

(a) Content is not appropriate or consistent with the terms of the permit;
(b) Animation and motion of images and messages is too fast and distracting and, as such compromises public safety;
(c) Sign has a negative impact on pedestrian or vehicular traffic flow and safety;
(d) Sign compromises public safety in any way.

3. The owner of an electronic sign shall be required to obtain an annual license and pay an annual fee to the Authority based on size, location and content of the electronic sign. In addition, the owner of an electronic sign will be required to pay, on an annual basis to the Authority, a percentage of any commercial revenue derived from advertisements or announcements for off-premise events or products displayed on such electronic sign.

4. The owner of a commercial electronic sign (except for building marquees) shall be required to devote ten (10%) percent of the sign's operational time for public service messages (weather, time, temperature, etc.) on a schedule determined and approved by the Authority.

5. Design Guidelines. To ensure that electronic signs are compatible with the character design features of the buildings and neighborhood, the following design guidelines are established:

(a) Electronic signs should not exceed five hundred fifty (550) square feet or one-fifth (1/5th) of the frontage of the building, unless the authority determines a larger sign is appropriate to the building and location;

(b) The design and content of each electronic sign should be consistent with the established theme or planning vision for the district/area;

(c) Electronic signs should respond to their location within the district and to the context of the surrounding district/area;

(d) Electronic signs that are interpretive of the district theme and location within the district are highly encouraged;

(e) Colors and intensity of illumination should be consistent with the theme of the district;

(f) Near and distant views should be taken into consideration when developing the size, location, and design of each electronic sign;

(g) The size, location, and design of electronic signs should highlight the specific use and architectural design of the building;

(h) Electronic signs should be well integrated into the architecture of the building, and not block existing windows or significant architectural features;

(i) Electronic signs located on a building should be located below the roof line, and preferably at the street level near the first floor;

(j) Electronic signs should be appropriate to the surrounding architecture of the street;

(k) Physical design and proportion of electronic signs as well as the design of content and messages should be innovative and not resemble a conventional static billboard;

(l) Overall dimensions and proportions of the electronic sign should not resemble conventional billboards in shape, size, design and content;

(m) Electronic signs that replace traditional marquee signs are encouraged;

(n) All projecting electronic signs that extend over a street are required to have separate approval from the Public Improvements Commission;

(o) Text on electronic signs should be kept to a minimum and bold use of graphics that reinforce the theme of the district and venue is encouraged;

(p) The content displayed on electronic signs in terms of both images and text should be appropriate for the general public;

(q) Abstract images and images that engage the public are encouraged rather than direct conventional product placements/promotions;

(r) Sponsorship information may be integrated into the graphics as part of the electronic sign;

(s) Electronic signs with third party sponsorship logo or information should be limited to thirty (30%) percent of the area of the sign or five (5) minutes within any thirty (30) minute cycle of animation;

(t) Electronic signs that are innovative in design and message delivery are highly encouraged; and

(u) Animation and motion of images should be slow and smooth. Images should dissolve gradually from one to another to avoid quick and frenetic changes of content that can be distracting and compromise public safety.

(^As inserted on April 25, 2007)

^SECTION 11-8. **Signs in Urban Renewal Project Areas.** In an urban renewal project area, there shall not be any sign which does not comply with this Article and with the urban renewal plan for such project area.

(^As amended on April 25, 2007)

^SECTION 11-9. **Conditional Sign Permits.** The Board of Appeal may grant conditional use permits in accordance with the procedure set out in Article 6 allowing signs other than those permitted by this regulation where the particular use or location justifies such exceptional treatment.

(^As amended on April 25, 2007)

Chicago (Illinois), City of. 2008. *Zoning Ordinance*.

Chapter 17-12. Signs.
17-12-0800 General standards.

17-12-0803 Incidental Signs.

17-12-0803-A *Incidental signs* that meet the standards of this subsection are allowed in all districts and are not counted in determining the total area of all *signs* on the *lot*.

17-12-0803-B Freestanding *incidental signs* may be up to 6 square feet in area and 42 inches in height. Wall-mounted *incidental signs* may be up to 6 square feet in area and 12 feet in height.

17-12-0803-C Direct or *indirect lighting* is allowed. *Changing-image sign* features and projections into the right-of-way are prohibited.

17-12-0803-D *Incidental signs* that do not meet the standards of this subsection must meet the district-specific standards for *permanent signs* and the area of such *signs* will be counted against a *lot*'s total maximum *sign* area limit.

17-12-0804 Temporary Signs.

17-12-0804-A Sign Features and Characteristics. *Temporary signs* may not be illuminated. *Changing-image sign* features and electronic elements are prohibited.

17-12-0900 Signs in residential districts.
17-12-0903 Sign Features.

17-12-0903-A Lighting. Signs in R and DR zoning districts may use only *indirect lighting*. *Direct lighting* and *internal lighting* of *signs* is prohibited, except in the case of allowed *changing-image signs*. *Flashing signs* are prohibited.

17-12-0903-B Changing-image Signs. Public and civic uses in R and DR districts may use *changing- image signs*.

17-12-0904 Off-premise Signs. *Off-premise signs* are prohibited in R and DR districts.
(Added Coun. J. 5-26-04, p. 25275)

17-12-1000 Signs in business, commercial, downtown and manufacturing districts.

17-12-1004 Sign Features and Characteristics. Signs that are allowed in B, C, M, DC, DX and DS districts are subject to the following standards:

Used with permission.

	B1, B2 Districts	DC, DX Districts	B3, C1, C3, DS Districts	C2, M Districts
Allowed Lighting	Direct, Indirect or Internal			
Changing-image Signs	Allowed, subject to Sec. 17-12-1005-B			
Flashing Signs	Prohibited	Allowed, subject to Sec. 17-12-1005-C		
Video Display Signs	Prohibited	Allowed, subject to Sec. 17-12-1005-G		

17-12-1005 Additional Standards for Specific Types of Signs.

17-12-1005-A Awning Signs. *Awning signs* must be affixed flat to the surface of the *awning* and not extend horizontally or vertically beyond the limits of the *awning*. *Awning signs* may not contain *internal lighting*.

17-12-1005-B Changing-image Signs. In B1 and B2 districts, *sign* face area devoted to *changing- image signs* may not exceed 25% of the maximum total *sign* area allowed under Sec. 17-12-1003 or 100 square feet. In all districts, *sign* face area devoted to *changing- image signs* may not exceed 25% of the maximum total *sign* area allowed under Sec. 17-12-1003 or 200 square feet.

17-12-1005-C Flashing Signs.

1. Maximum Area. The total *sign* face area of all *flashing signs* on a *lot* may not exceed 25% of overall *sign* area limit or 100 square feet, whichever is less.

2. Maximum Height. No part of any *flashing sign* may exceed a height of 24 feet.

3. Prohibited Locations. *Flashing signs* are prohibited in the following locations:

(a) B1 districts;
(b) B2 districts;
(c) Within 125 feet of any R or public park with an area of 2 acres or more;
(d) Within 100 feet of any DR district;
(e) Within 500 feet of Lake Shore Drive;
(f) Within 500 feet of any expressways or toll roads, as designated by the Chicago Department of Transportation; and
(g) Within 500 feet of Michigan Avenue, between Oak Street on the north and Roosevelt Road on the south.

17-12-1005-G Video Display Signs.

1. Maximum Area. The total *sign* face area of a *video display sign* may not exceed 25% of the subject *lot*'s overall *sign* area limit or 100 square feet, whichever is less.

2. Maximum Height. No part of any *video display sign* may exceed a height of 24 feet.

3. Prohibited Locations. *Video display signs* are prohibited in the following locations:

(a) B1 districts;

(b) B2 districts;
(c) Within 100 feet of any R or DR district or public park with an area of 2 acres or more;
(d) Within 500 feet of Lake Shore Drive;
(e) Within 500 feet of any expressways or toll roads, as designated by the Chicago Department of Transportation; and
(f) Within 500 feet of Michigan Avenue, between Oak Street on the north and Roosevelt Road on the south.

17-12-1006 Additional Standards for Off- premise Signs.

17-12-1006-A Separation from R and DR Districts.

1. *Off-premise signs* with a *sign* face area of more than 100 square feet are prohibited within 250 feet of any *residential district*.
2. *Off-premise signs* are prohibited entirely within 100 feet of any *residential district*.
3. These distances are to be measured as a straight-line distance from a point on the *sign* face nearest the R or DR district to nearest *residential district* boundary. (See Sec. 17-1-0803 for rules governing interpretation of zoning district boundaries)

17-12-1006-I Flashing and Video Display Elements. *Off-premise signs* may not contain flashing elements or video displays.

17-12-1100 Special sign districts.

17-12-1101 Michigan Avenue Corridor Special Sign District.

17-12-1101-A Boundaries. The Michigan Avenue Corridor special *sign* district consists of all parcels adjacent to Michigan Avenue, between Oak Street on the north and Roosevelt Road on the south.

17-12-1101-B Regulations and Standards. The following standards apply to *signs* within the Michigan Avenue Corridor special *sign* district. These *sign* regulations are supplemental standards that apply in addition to existing zoning regulations. All existing zoning regulations apply except those that conflict with regulations imposed for the Michigan Avenue Corridor. In case of conflict between the Michigan Avenue Corridor regulations and existing, underlying zoning district regulations, the Michigan Avenue Corridor regulations will govern.

8. Neon Signs. Neon *signs* and other forms of *direct lighting* using tubes similar in appearance to neon are prohibited when visible from Michigan Avenue. Neon lighting may be used as a source of light when completely shielded and not visible from public *streets*, sidewalks, or *alleys*.

9. Flashing and Changing-image Signs. No flashing or *changing-images sign* are permitted on the exterior of any building or structure on the Michigan Avenue frontage.

17-12-1102 Oak Street Corridor Special Sign District.

17-12-1102-A Boundaries. The Oak Street Corridor special *sign* district consists of all parcels adjacent to Oak Street, between Michigan Avenue on the east side and State Street on the west.

17-12-1102-B Regulations and Standards. The following standards apply to *signs* within the Oak Street Corridor special *sign* district. These *sign* regulations

are supplemental standards that apply in addition to existing zoning regulations. All existing zoning regulations apply except those that conflict with regulations imposed for the Oak Street Corridor. In case of conflict between the Oak Street Corridor special *sign* district regulations and other zoning regulations, the Oak Street Corridor regulations will govern.

6. Prohibited Signs. The following types of *signs* are prohibited within the Oak Street Corridor special *sign* district:

(a) free-standing ground *signs*;

(b) *banners*;

(c) neon *signs* (neon tubing may be used as a source of light when completely shielded and not visible from public streets, sidewalks or *alleys*);

(d) flashing,

(e) *changing-image signs*; and

(f) *off-premise signs*.

17-12-1103 State Street/Wabash Avenue Corridor Special Sign District.

17-12-1103-A Boundaries. The State Street/Wabash Avenue Corridor consists of all parcels adjacent to State Street and Wabash Avenue between Wacker Drive on the north and Harrison Street on the south. The State Street/Wabash Corridor extends west of State Street to the east right-of-way line of North and South Dearborn Street and extends east of Wabash Avenue to the west boundary line of the Michigan Avenue Corridor.

17-12-1103-B Regulations and Standards. The following standards apply to *signs* within the State Street/Wabash Avenue Corridor special *sign* district. These *sign* regulations are supplemental standards that apply in addition to existing zoning regulations. All existing zoning regulations apply except those that conflict with regulations imposed for the State Street/Wabash Avenue Corridor special *sign* district. In case of conflict between the State Street/Wabash Avenue Corridor regulations and existing, underlying zoning district regulations, the State Street/Wabash Avenue Corridor regulations will govern.

6. Flashing and Changing-image Signs. Except for theater *signs* and *marquees*, no flashing or *changing-image signs* are permitted on the exterior of any building or structure in the State Street/Wabash Avenue Corridor.

Chapter 17-17 . Terminology And Measurements

17-17-0200 General terms.

17-17-0234 Changing-image Sign. Any *sign* that, through the use of moving structural elements, sequential lights, lighting elements, or other automated method, results in movement, the appearance of movement or change of *sign* image or message. *Changing-image signs* do not include otherwise static *signs* where illumination is turned off and back on not more than once every 24 hours.

17-17-0251 Electric Sign. Any *sign* containing electrical wiring, lighting or other electrical components, but not including *signs* illuminated by a detached exterior light source.

17-17-0256 Flashing Sign. Any *sign* or portion of a *sign* that contains an intermittent or flashing light source or that changes light intensity in sudden

transitory bursts. Example of *flashing signs* include *signs* that contain or use strobe lights, or rotating lights; *signs* with blinking or flashing features that are designed to merely to attract attention rather than convey a message; and *changing-image signs* that do not comply with applicable standards.

17-17-02190 Video Display Sign. A *sign* capable of displaying full-motion imagery of television quality or higher.

SECTION 6 – SIGNS:

I. AUTHORITY

The Sign Ordinance, O-205-2007, adopted September 25, 2007, as amended, is intended to supersede and replace Article IV, Section 6 – Signs, of Ordinance O-191, Appendix C, of the Code of Ordinances of the City-Parish of Lafayette, Louisiana, and it shall be codified as such.

II. PURPOSE AND INTENT

This ordinance is enacted to protect the health, safety, and welfare of the citizens of the City of Lafayette and to facilitate the creation of an attractive and harmonious community by establishing standards for the construction of signs, to allow businesses to clearly identify themselves while avoiding and eliminating visual clutter.

III. APPLICABILITY

Except as otherwise provided herein, these sign regulations shall apply to all signs located or proposed to be located within the City of Lafayette.

IV. SIGN DEFINITIONS:

ABANDONED SIGN - A sign that no longer identifies a bona fide business, service, owner, product, activity, or event. The definition shall also include a sign structure which no longer supports the sign for which it was designed.

BANNER – A sign made of fabric, flexible plastic, or other non-rigid material. A banner shall be considered a temporary sign.

BILLBOARD/OFF-PREMISE ADVERTISING SIGN - An advertising sign that directs the attention of the public to a business activity conducted, or product sold or offered for sale at a location not on the same premises where such sign is located.

Exclusions:

(1) An Official Business Directional Sign erected and maintained by the State of Louisiana, Department of Transportation and Development, or any other entity authorized by the State, which indicates to the traveling public the route and/or distance to scenic, historic, cultural, educational, recreational or service sites or locations of interest shall not be deemed to be included within the definition of BILLBOARD/OFF-PREMISE ADVERTISING SIGN.

(2) Any advertisement structure permitted, authorized or contracted for by a State, Parish or municipal governing authority pursuant to LSA-R.S.32:236 under the terms of which advertising is allowed on convenience facilities such as benches, shelters, kiosks and other items located within public rights of way as designated stops of a public transit system, shall not be deemed to be included within the definition of BILLBOARD/OFF-PREMISE ADVERTISING SIGN.

(3) An approved and permitted sign for an integrated business center, which includes multiple tenant identification signs, shall not be deemed to be included with the definition of BILLBOARD/OFF-PREMISE ADVERTISING SIGN.

BILLBOARD/OFF-PREMISE ADVERTISING SIGN, DIGITAL – A sign capable of displaying words, symbols, figures or images that can be electronically changed by remote or automatic means.

BUILDING SIGN – A sign that is attached to a building.

BUSINESS/ON-PREMISE SIGN – A sign that directs attention to a business or profession or to a commodity, service, or entertainment sold or offered upon the premises where such sign is located.

DIRECTIONAL SIGN – An on-site sign that is designed and erected solely for the purposes of directing vehicular and/or pedestrian traffic within a project.

FLASHING SIGN – A sign illuminated by an intermittent light source.

FREESTANDING SIGN – A sign permanently attached to the ground and independent of a building.

HISTORIC SIGN – See Landmark Sign.

ILLUMINATED SIGN – A sign illuminated by one or more lighting devices.

LANDMARK SIGN – A sign designated as a Landmark or having historic value as determined by the Lafayette Preservation Commission. A sign may be designated as a Landmark Sign when it is associated with one or more historic figures, events, or places, or is considered significant as evidence of the history of the product, business, or service advertised.

MOBILE BILLBOARD – An off-premise advertising sign mounted on a vehicle or trailer that can become part of traffic flow or be parked at specific locations. A vehicle which advertises the company of its primary use is not considered a mobile billboard.

MONUMENT SIGN – An independent sign affixed to the ground and supported from grade to the bottom of the sign with the appearance of having a solid base. A monument sign is not a pole sign.

NAMEPLATE SIGN – A sign, attached to a building, which states the name and/or address of the profession or business on the lot where the sign is located.

POLE SIGN – A freestanding sign attached to a pole or poles erected directly into the ground.

POLITICAL SIGN – A sign which advocates a position on an issue, the candidacy of a person or a party on an upcoming ballot.

PROJECTING SIGN – A sign attached to the wall of a building and extending out more than 15 but not more than 72 inches. For the purpose of this Ordinance, a sign hanging from a projecting roof shall be considered a projecting sign and shall be limited to a maximum length of 72 inches; however, such sign shall not exceed the bounds of the roof projection.

READERBOARD – A sign designed to have changeable copy, either manually or electronically. A readerboard may be freestanding or attached to a building.

SIGN – An object, device, display, or structure, or any part thereof, situated outdoors or indoors, which is used to advertise, identify, display, direct or attract attention to an object, person, institution, organization, business, product, service, event, or location by any means, including words, letters, figures, designs, symbols, fixtures, colors, or illuminated or projected images. Signs do not include the flag or emblem of any nation, organization of nations, state, or city, or any fraternal, religious, or civic organization; merchandise, pictures, or models of products or services incorporated in a window display; works of art which in no way identify a product; or scoreboards located on athletic fields.

SNIPE SIGN – A sign, made of any material, which is attached to a tree, pole, stake, fence, or other object, and which contains advertising matter that is not applicable to the use of the premises upon which it is located.

STACKING OF A SIGN – The placement of more than one sign face on a structure intended for the attachment of one face per side on a business sign.

SURFACE AREA OF A SIGN – The entire area within a single continuous perimeter enclosing the extreme limits of the actual sign surface. It does not include any structural elements outside the limits of the sign that do not form an integral part of the display. Only one side of a double-face or V-type sign structure shall be used in computing total surface area.

TEMPORARY SIGN – A sign that is not permanently secured to the ground or a permanent structure.

WALL SIGN – A sign affixed flat against the wall of a building and which is not more than 15 inches in thickness.

V. GENERAL REGULATIONS – The following regulations shall apply to signs located in the City of Lafayette, unless otherwise provided for elsewhere in this Ordinance:

A. Permit Required – A sign permit must be obtained from the Planning, Zoning and Codes Department prior to the installation, structural alteration, repair, reconstruction or refacing of a sign. The sign shall be constructed and erected in accordance with the Building Code of the City-Parish of Lafayette. For purposes of this permit requirement, a sign shall be deemed to be structurally altered, repaired, reconstructed or refaced if the costs incurred to accomplish any such activity exceeds 50% of the replacement value of such sign. A sign permit application must provide information as required.

B. Size – The maximum allowed surface area of a sign shall be calculated using the lot or building dimension (depending on the zoning district) along the street on which a freestanding sign is located, or a building or wall sign faces.

C. Height and Type – See individual zoning district regulations.

D. Setbacks – See individual zoning district regulations.

E. Location

1. Private Property – Signs must be attached to or located on private property. No sign may be located in a public right-of-way or attached to a utility pole, tree or other vegetative matter, fence, highway marker or regulatory sign, or other public property.

2. Safety – No sign shall be erected so as to prevent free ingress or egress from any door, window, or fire escape; and no sign of any kind shall be attached to a standpipe or fire escape. No sign shall in any manner create a public safety hazard.

3. No sign shall be located in a sight triangle. See graphics in Appendix A (A-11, A-12).

4. No sign shall be positioned so as to allow any portion of same to infringe upon any easement or the vertical plane of said easement or interfere with power lines or other utility systems.

F. Illumination

1. The illumination of a sign within 100 feet of and facing a residential zoning district shall be diffused or indirect and designed to prevent direct rays of light from shining into the adjoining residential district. A neon or plastic face sign with interior lighting is considered a diffused or indirectly lighted sign.

2. Exposed lighting sources, except as provided for above, are prohibited.

3. In no event shall revolving, flashing or intermittent illumination be allowed. Where readerboards or digital billboards are allowed, a message shall be displayed a minimum of eight seconds. Transition from one message to the next shall be instantaneous and shall not contain such visual effects as fading dissolves, flashing, etc.

4. An external lighting device may not extend more than 72 inches over public or private property, and the lowest part of the device must be at least 15 feet above the finished grade.

G. Non-Conforming Sign

1. Once changed to a conforming sign, no sign shall be permitted to revert to a non-conforming sign.

2. On-premise – A sign legally existing prior to the adoption of this ordinance that does not conform to these provisions shall not be changed in overall dimensions, or altered except to conform to the provisions of this ordinance.

   a. A lawfully existing non-conforming sign on an individual business site or an out parcel of an integrated business center may not be enlarged, reworded (other than readerboards), redesigned or altered in any way, except to conform to the requirements of these restrictions. An existing business may reword or reface the sign unless the ownership of the business has changed.

   b. Change of Occupancy – When occupancy of an individual business site or an out parcel of an integrated business center changes, all non-conforming signs on the site must be modified so as to fully comply with the provisions of this ordinance.

   c. Destruction, Damage, Deterioration of Sign – A sign that has been destroyed, damaged or deteriorated to such an extent that the cost of restoration would exceed 50 percent of the replacement cost, shall not be repaired, rebuilt or altered except to conform with the requirements of these restrictions.

   d. Damage or Destruction of Building – A non-conforming sign shall be removed if the building to which it is accessory is damaged or destroyed to the extent of 50 percent or more of the principal building's appraised value.

   e. Replacement – A sign replacing a non-conforming sign shall conform with the provisions of this Section, and the non-conforming sign shall no longer be displayed.

   f. A sign requiring removal by the Lafayette Consolidated Government or its designee as a result of provisions of this Section shall be assessed a standard fee as determined by the Lafayette City-Parish Planning and Zoning Commission for such removal, not being less than $100.

   g. A permit fee shall not be charged when a non-conforming sign is replaced with a conforming sign.

3. Off-premise – No dimension of a billboard/off-premise advertising sign legally existing prior to the adoption of this ordinance may be increased.

   a. Destruction, Damage, Deterioration of Sign

      i. A non-conforming sign may be reconstructed in its existing location only if damaged by vandalism, fire, storm or other act of God or the public enemy. Such reconstruction must take place within six months of the damage.

ii. If a sign is structurally altered, repaired or refaced, no increase in any dimension, surface area, the number of faces or the height of the sign from that which existed immediately prior to the occurrence of the damage shall be allowed.

iii. If the sign is not repaired within six months after the occurrence of the damage, this provision shall not apply, no repair shall be allowed, and the sign shall be removed at the expense of sign owner.

iv. If damaged or destroyed by vandalism, fire, storm or other Acts of God or other public enemy, the sign may be repaired only if the cost of repair to said structure is less than 50% of its current fair market value.

b. Digital billboard/off-premise advertising sign face conversions

i. An existing, legally non-conforming, billboard/off-premise advertising sign face may be converted to one static, intermittently changeable, digital display with the following conditions:

Removal of billboard/off-premise advertising signs

a) For each digital sign face conversion, signage located within the jurisdiction of Lafayette Consolidated Government totaling a minimum of two times the surface area of the proposed digital sign face being converted shall be permanently removed.

b) In the event that a billboard owner who proposes conversion of a billboard to a digital face did not as of the effective date of this ordinance own sufficient signage to meet the requirement to remove twice the surface area of the digital sign face, then in such event and only such event, one digital face conversion shall be approved. Further provided, the digital conversion of any sign acquired subsequent to the effective date of these provisions shall not be allowed.

ii. Distance - The converted digital structure may be located no closer than 300 feet to a residential zoning district. Measurement shall be from the residential zoning district to the outermost portion of each sign.

iii. Spacing – No sign proposed for conversion may be closer than 1,500 feet to another digital billboard/off-premise advertising sign; provided however, that a billboard converted under the provisions set forth in "b. i. b)" above shall not be subject to the spacing requirement set forth herein. Measurement shall be to the outermost portion of each sign.

iv. Message Display Intervals – Each message appearing on a digital billboard face shall remain fixed for a minimum of eight seconds, and message changes shall be instantaneous and shall not contain such visual effects as fading dissolves, flashing, etc.

v. Illumination – Display brightness shall be adjusted as ambient light levels change and shall be subject to review and regulation as determined by the Planning, Zoning and Codes Department.

vi. Malfunction Display Lock – Digital billboards shall contain a default design that will freeze the sign in one position if a malfunction occurs or in the alternative shut down.

vii. Emergency Information – The operator of a digital billboard shall at the request of Lafayette Consolidated Government or the Lafayette Emergency Communications District make every effort to display emergency messages, such as Amber Alerts, road closures and evacuation information, as a public service and at no cost to requesting authority. Such messages shall be displayed in appropriate locations and with appropriate frequency until the emergency no longer exists or the authority requests termination.

viii. Inventory Required – A company that converts an existing billboard/off-premise advertising sign to a digital display must provide, with each permit application, a complete current inventory of its signs located within the jurisdiction of Lafayette Consolidated Government. The inventory shall include location, size and number of faces, and means of illumination.

c. The provisions of this Section G(3) shall apply to all signs located in the City of Lafayette and the unincorporated areas of Lafayette Parish.

4. Nothing contained herein shall be construed to prevent normal maintenance, repairs, repainting, or posting of such business or billboard/off-premise advertising signs.

H. Landmark Sign – A sign existing prior to the effective date of this ordinance, and designated as a Landmark Sign by the Lafayette Preservation Commission, shall be exempt from the provisions of this ordinance. Any proposed alteration to a Landmark Sign, except to bring said sign into compliance with these regulations, must be approved by the Lafayette Preservation Commission. In order to retain its Landmark Sign designation, the sign must be maintained in good repair.

I. Temporary Sign – A permit for an on-premise sign indicating an event of public interest, such as a festival, state or local fair, cattle or horse show, business grand opening, etc., may be approved by the Zoning Administrator for up to 45 days. It shall be removed by the applicant at the end of the permit period. All other temporary signs are expressly prohibited.

J. Political Sign – In addition to otherwise allowed signs, the following shall apply:

1. With the exception of messages displayed on billboards, a political sign may be erected only on private property, outside the sight triangle where applicable.

2. The sign may be installed no more than 90 days prior to the balloting for which it was prepared, and shall be removed within 10 calendar days following the decisive vote.

3. Residential Zoning District – A political sign shall not exceed eight square feet in area.

4. Business or Industrial Zoning Districts – With the exception of messages displayed on billboards, a political sign shall not exceed 32 square feet in area.

K. Unsafe Sign – Whenever a sign becomes structurally unsafe or endangers the safety of a building or premises, or endangers the public safety, as determined by the Planning, Zoning and Codes Department, the Department shall give written notice to the owner of the sign or the owner of the premises on which the sign is located that such sign be made safe or removed.

L. Abandoned Sign – A sign which advertises, identifies or pertains to a business or service no longer in existence, or an activity or event that has occurred in the past shall be removed by its owner or persons otherwise responsible within 180 days from the time the activity ceases.

M. Variance – To provide reasonable flexibility in these regulations, an application for a variance may be filed with the Board of Zoning Adjustment to allow a sign which may not conform to these regulations.

N. Prohibited Signs:

1. Signs installed or erected without a sign permit
2. Off-premise advertising signs, except as allowed for integrated business centers
3. Signs extending into, or placed within, the public right-of-way or an easement, or affixed to any public property
4. Mobile billboards or portable trailer signs
5. Signs with lasers or lights that blink, flash, revolve, or strobe, including animation or video
6. Signs that contain mirror-like surfaces
7. Signs that emit smoke, vapor, particles, sound, or odor
8. Wind or fan blown signs
9. Snipe signs
10. Temporary product-specific signs
11. On-site signs placed on off-site signs
12. Off-premise advertising signs in the unincorporated areas of Lafayette Parish

VI. SIGNS IN RESIDENTIAL ZONING DISTRICTS – In residential zoning districts, only the following signs shall be allowed:

A. One sign, not to exceed two square feet in surface area, providing non-commercial content, such as the name and/or address of the owner or lessee of the residence, and/or a one square-foot business sign for an approved Home Occupation.

B. One non-illuminated sign, not to exceed 12 square feet in surface area, pertaining to the lease or sale of a building or lot.

C. One sign per street entrance, advertising only the development of a new subdivision of five lots or more. Such sign shall not exceed 150 square feet in surface area or 10 feet in height and may be installed for no longer than one year.

D. One non-illuminated sign, not to exceed 32 square feet in surface area, identifying a developer, engineer, architect, or contractor engaged in the construction of a building or development. This sign may not exceed 10 feet in height and must be removed within 30 days following occupancy of the building.

E. One identification or informational sign, not to exceed 50 square feet in surface area for the following: church, school, library, farm, park, subdivision, townhouse or condominium development, apartment complex, or similar use. It may be illuminated but not flashing.

F. On-premise directional signs, not to exceed two square feet in surface area. One on-premise directional sign shall be allowed for each entrance and each exit onto or from a public or private street.

G. One nameplate sign per building, not to exceed five square feet in surface area, for a group of dwelling units. Such sign may indicate the names and addresses of the buildings, or it may be a directory of occupants.

H. A political sign (with restrictions – see Signs, General Regulations, Paragraph V(J).

I. Setback – Each sign shall be setback a minimum of one foot from each property line. It may not be located in an easement or interfere with power lines or other utility systems.

VII. SIGNS IN B-1-M AND B-1-O ZONING DISTRICTS – Signs are allowed subject to the following regulations:

A. Content – A sign may advertise only the name and type of company, name and field of specialty of the business and/or address of the building from which the business is conducted. A readerboard is prohibited.

B. Freestanding Sign – Each lot may have one freestanding business sign.

1. Height and Type – The sign shall not exceed four feet in height and must be a monument sign.

2. Size – The sign shall not exceed eight square feet in surface area.

3. Setback – The sign shall be set back a minimum of one foot from each property line of the business site. It may not be located in an easement or interfere with power lines or other utility systems.

C. Building or Wall Sign – Each building may be identified by no more than one sign displayed on any given side of the building.

1. Size – The surface area of the sign shall not exceed eight square feet in area.

2. Installation – The sign shall be displayed flat against the building.

CHAPTER 19

SIGN REGULATIONS
(2498,2658,2737, 3604/RESO. 7338,3766,3935)

SECTION:

11-19-1: PURPOSE AND APPLICATION (3939/RESO. 7745)
11-19-2: NONCONFORMING AND DISCONTINUED SIGNS (3939/RESO. 7745)
11-19-3: REPEAL AND SEVERABILITY (3939/RESO. 7745)
11-19-4: VIOLATIONS AND ENFORCEMENT (3939/RESO. 7745)
11-19-5: DEFINITIONS OF TERMS (3939/RESO. 7745)
11-19-6: SIGNS PERMITTED BY ZONING DISTRICT (3939/RESO. 7745)
11-19-7: TEMPORARY SIGNS (3939/RESO. 7745)
11-19-8: GENERAL PROVISIONS (3939/RESO. 7745)

11-19-1: PURPOSE, AND APPLICATION: (3939/RESO. 7745)

(A) The purpose of this Sign Ordinance regulating signs of all types is to: (3939/Reso. 7745)

1. Preserve and protect the public health, safety, and welfare within the City of Mesa. (3939/Reso. 7745)

2. Encourage development of private property in harmony with the desired character of the City while providing due regard for the public and private interests involved. (3939/Reso. 7745)

3. Promote the effectiveness of signs by preventing their overconcentration, improper placement, deterioration, and excessive size and number. (3939/Reso. 7745)

4. Enhance the flow of traffic and the convenience, ease, and enjoyment of travel within the City of Mesa. (3939/Reso. 7745)

5. To protect travelers in the City of Mesa from injury or damage as a result of distraction or obstruction of vision attributable to signs. (3939/Reso. 7745)

(B) The intent of the application of this Ordinance is to: (3939/Reso. 7745)

1. Reduce advertising distractions which may contribute to traffic accidents. (3939/Reso. 7745)

2. Assure that public benefits derived from expenditures of public funds for the improvement and beautification of streets and other public structures and spaces shall be protected by exercising reasonable control over the character and design of sign structures. (3939/Reso. 7745)

3. Provide an improved visual environment for the citizens of and visitors to the City of Mesa, Arizona. (3939/Reso. 7745)

4. Require that signs are properly maintained for safety and visual appearance. (3939/Reso. 7745)

(C) This Sign Ordinance establishes procedures for the enforcement, interpretation, and processing of variances, Use Permits, Special Use Permits, Council Use Permits, and appeals, and for violations and penalties for infractions of the sign regulations. (3939/Reso. 7745)

Used with permission.

11-19-4: VIOLATIONS AND ENFORCEMENT: (3939/RESO. 7745)

(A) It is hereby declared unlawful for any person, firm, or corporation to construct, place, install, alter, change, maintain, use, or to permit the construction, placement, installation, alteration, change, maintenance, or use of any sign contrary to or in violation of any provisions of this Ordinance, or of any provision designated as a condition of approval either by the plan review process or through an amendment, Special or Council Use Permit, variance, site plan review, design review, or appeal by an office, board, commission, or the City Council, as established by this Ordinance. (3939/Reso. 7745)

(B) The installation, construction, or display of any illegal or prohibited sign is hereby declared unlawful and a violation of this Ordinance. (3939/Reso. 7745)

Enforcement of the provisions of this Chapter shall be pursuant to the provisions contained in Section 11-1-5 of this Title. (4074)

(C) Variances, Special Use Permits and Interpretations. (3939/Reso. 7745,4074)

1. An application for a request for variance from the provisions of this Ordinance shall be submitted with the Office of the Zoning Administrator in accordance with Title 11, the Administration and Procedures chapter of the Mesa City Code. A variance may only be granted upon a finding by the Zoning Administrator or Board of Adjustment that: (3939/Reso. 7745)

   (a) There are special circumstances or conditions applying to the land, building, or use referred to in the application; and (3939/Reso. 7745)

   (b) That such special circumstances or conditions are preexisting and not created by the property owner or appellant; and (3939/Reso. 7745)

   (c) The authorizing of the variance is necessary for the preservation and enjoyment of substantial property rights; and (3939/Reso. 7745)

   (d) The authorizing of the variance will not be materially detrimental to persons residing or working in the vicinity of the property, to the neighborhood, or the public welfare in general. (3939/Reso. 7745)

2. Applications for Special Use Permits required by this Ordinance, shall be filed with the Office of the Zoning Administrator in accordance with Title 11, the Administration and Procedures chapter of the Mesa City Code. A Special Use Permit may only be granted upon a finding by the Zoning Administrator or Board of Adjustment that the sign covered by the permit and any related use or building will not be detrimental to persons residing or working in the vicinity, to adjacent property, to the neighborhood, or to the public welfare in general. (3939/Reso. 7745)

3. Requests for interpretations of the provisions of this Ordinance shall be filed with the Office of the Zoning Administrator in accordance with Title 11, the Administration and Procedures chapter of the Mesa City Code. The terms and provisions of this Ordinance cannot be changed through an interpretation. (3939/Reso. 7745)

11-19-5: DEFINITIONS OF TERMS: (3939/RESO. 7745)

(A) **ANIMATED:** The movement of any light used in conjunction with a sign such as blinking, traveling, flashing or changing degree of intensity of any light movement other than burning continuously. (3939/Reso. 7745)

(B) **ATTACHED SIGN:** Any sign which is fastened, attached, connected, or supported in whole or in part as a building. (3939/Reso. 7745)

(L) **DIRECTIONAL SIGN:** A sign which includes copy offering pertinent directional information for the purpose of assisting in the flow of vehicular or pedestrian traffic. (3939/Reso. 7745)

(M) **DIRECTORY SIGN:** A sign listing name, use, and/or location within a building, building complex, or multi-tenant development. (3939/Reso. 7745)

(N) **ELECTRONIC MESSAGE DISPLAY:** A sign capable of displaying words, symbols, figures, or images that can be electronically changed by remote or automatic means. Such signs shall include the following modes of operations: (4105)

1. Static. Signs which include no animation or effects simulating animation. (4105)

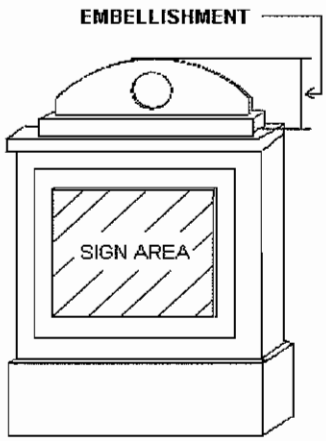
2. Fade. Signs where static messages are changed by means of varying light intensity, where the first message gradually reduces intensity to the point of not being legible and the subsequent message gradually increases intensity to the point of legibility. (4105)

3. Dissolve. Signs where static messages are changed by means of varying light intensity or pattern, where the first message gradually appears to dissipate and lose legibility simultaneous to the gradual appearance and legibility of the subsequent message. (4105)

4. Travel. Signs where the message is changed by the apparent horizontal movement of the letters or graphic elements of the message. (4105)

5. Scrolling. Signs where the message is changed by the apparent vertical movement of the letters or graphic elements of the message. (4105)

(O) **EMBELLISHMENT:** Structural or decorative elements of a sign incorporating representations of the significant architectural features of the associated building or development. Embellishment shall not include letters, numerals, figures, emblems, logos, colored bands, or other features conveying a commercial advertising message. (3939/Reso. 7745,4105)



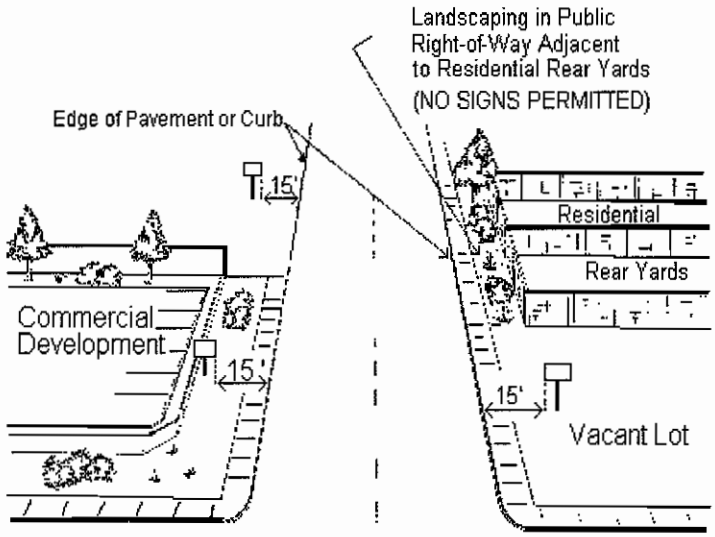
(P) **FIXED BALLOON:** Any lighter-than-air or gas-filled inflatable object attached by a tether to a fixed place. (3939/Reso. 7745,4105)

(Q) **FREESTANDING SIGN:** Same as detached sign. (3939/Reso. 7745,4105)

3. In Single Residence districts on lots larger than one (1) acre and in all other zoning districts, one (1) sign per street frontage per lot or parcel for each candidate or measure not exceeding thirty-two (32) square feet in area or eight feet (8') in height. (3939/Reso. 7745)

4. Signs shall not be displayed earlier than sixty (60) days prior to an election and shall be removed within ten (10) days following said election. Signs for successful primary election candidates eligible for the general election may remain after the primary election. (3939/Reso. 7745)

5. Signs shall be set back at least fifteen feet (15') from the existing curb or from the edge of pavement where no curb or sidewalk exist (see figure below). (3939/Reso. 7745)



6. Signs shall not be placed in any portion of the public right-of-way located between a street or sidewalk and a property line fence (i.e., residential lot backup to an arterial street). (3939/Reso. 7745)

7. The person, party, or parties responsible for the distribution and display of such signs shall be individually and jointly responsible for their removal. (3939/Reso. 7745)

11-19-8: GENERAL PROVISIONS: (3939/RESO. 7745)

(A) Purpose and Intent. (3939/Reso. 7745)

The purpose of this Chapter is to allow for consideration of unusual situations or special circumstances that require additional provisions and regulations. It is also the intent to provide procedures for the administration of this Chapter, to identify prohibited signs, to establish procedures for obtaining permits, and to provide for the removal of dangerous and discontinued signs. (3939/Reso. 7745,4270)

(B) Exceptions and Signs Not Requiring a Permit. (3939/Reso. 7745)

1. Exceptions. The provisions of this Chapter shall not apply to the following, and are therefore excepted. Note: Electric permit required for all exterior electric signs. (3939/Reso. 7745,4270)

(e) Window signs as permitted in 11-19-6, Tables 1 and 2, of this Chapter (3939/Reso. 7745,4270)

(C) Prohibited Signs.* (3939/Reso. 7745)

1. The following signs and conditions are prohibited: (3939/Reso. 7745,4270)

(a) "A" frame and all other portable signs except as permitted in 11-19-7(B), 11-19-6(F), and 11-19-8(D) of this Chapter. (3939/Reso. 7745)

(b) Vehicle signs which are displayed for the purpose of exhibiting commercial advertising, identifying an on-site business, or supplying directional information to an off-site business, by means of any of the following which proves a violation: (3939/Reso. 7745, 4157)

i. The absence of a current, lawful license plate affixed to the vehicle on which the sign is displayed; or (4157)

ii. The vehicle being inoperable as defined in Section 8-6-2 of the Mesa City Code; or (4157)

iii. The vehicle on which the sign is displayed is not parked in a lawful or authorized location, or is on blocks or other supports, or is parked in a manner that is distinct or different from the pre-determined parking area design; or (4157)

iv. The vehicle on which the sign is displayed is not used for business activities associated with the product(s) or service(s) designated by the vehicle sign for two (2) consecutive business days; or (4157)

v. The vehicle on which the sign is displayed is a part, section, or element of an outdoor display by a dealership or business of transportation vehicles such as motor vehicle, recreational vehicle, watercraft, manufactured home, motorcycle, or utility trailer. (4157)

(c) Balloons, banners, advertising flags, and nonrigid signs, except as permitted in Sections 11-19-7(F) and 11-19-8(D) of this Chapter. (3939/Reso. 7745,4270)

(d) Off-site signs (billboards), except as permitted in Section 11-19-7(E) of this Chapter. (3939/Reso. 7745,4270)

(e) Signs that employ intermittent or flashing illumination, animation, stereopticon, motion picture, or laser projection, sound emission, rotation or other movement, visible moving parts, or any device creating the illusion of motion (except time and temperature units and electronic message displays as defined in this Chapter). (3939/Reso. 7745,4105)

(f) Signs located within a public right-of-way or attached signs which project more than fifteen inches (15") into a public right-of-way or are less than eight feet (8') above grade, except political signs placed in conformance with 11-19-7(G) of this Chapter. (3939/Reso. 7745)

(g) Signs displayed in a location prohibited by this Chapter. (3939/Reso. 7745,4270)

(h) Signs placed so as to prevent or inhibit free ingress to or egress from any door, window, or any exit way required by the Mesa Building Code, or by Fire Department Regulations. (3939/Reso. 7745,4270)

(i) Signs attached to any public utility pole or structure, streetlight, tree, fence, fire hydrant, bridge, curb, sidewalk, park bench, bus bay, or other location on public property. (3939/Reso. 7745,4270)

(j) Signs placed in a location which obstruct the view of any traffic sign, signal, or other traffic- control sign, or of a vehicle operator entering, exiting, or traveling upon the public right-of-way. (3939/Reso. 7745,4105)

(k) Signs that by way of shape, color, or position may be confused with any authorized traffic- control or public directional sign. (3939/Reso. 7745, 4105)

(l) Discontinued signs under 11-19-2(C) of this Chapter. (3939/Reso. 7745)

(m)Pole signs within the Town Center Redevelopment area. (3939/Reso. 7745)

(n) Roof signs within the Town Center Redevelopment area. (3939/Reso. 7745)

*Signs not otherwise permitted by this Chapter can be permitted by a Comprehensive Sign Plan for businesses/development in the Town Center Redevelopment area. (3939/Reso. 7745,4270)

(D) Supplemental Provisions. (3939/Reso. 7745)

1. Schools, churches, or other places of worship located in the AG and Single Residence districts are permitted signage in accordance with Section 11-19-6(D) of this Chapter, except in the Town Center Redevelopment area where such signage is permitted according to Section 11-19-6(F) of this Chapter. (3939/Reso. 7745,4270)

2. If a sign is externally illuminated, the source of illumination shall not be visible from any adjacent residential zone district, and shall comply with the Outdoor Light Control ordinance of the Mesa City Code, and the Mesa Electrical Code. (3939/Reso. 7745,4270)

3. Buildings exceeding three (3) stories shall only be identified by the building, building complex, or development name, unless modified by a comprehensive sign plan as provided in this Section, except all buildings over one (1) story in the Town Center Redevelopment area must obtain a Comprehensive Sign Plan. (3939/Reso. 7745,4270)

4. No detached sign shall be located within fifty feet (50') of any other detached sign on the same parcel or development site. (3939/Reso. 7745)

5. No sign shall be placed within the future width line of a public street as specified in Chapter 13 of this Title except in the Town Center Redevelopment area, which may be placed within such future width line subject to a sign agreement. A sign agreement shall require a certificate of insurance and comply with the following criteria: (3939/Reso. 7745,4270)

   (a) Public liability insurance in an amount not less than five hundred thousand dollars ($500,000.00) for injuries to each person, and in an amount not less than five hundred thousand dollars ($500,000.00) for any one (1) occurrence. (3939/Reso. 7745)

   (b) Property damage insurance in an amount not less than five hundred thousand dollars ($500,000.00) for damage to the property of each person on account of any one (1) occurrence. (3939/Reso. 7745)

(b) Are compatible and harmonious with the primary color(s), style, and architecture of the building or development; (3939/Reso. 7745)

(c) Are integrated into the primary physical elements of the building or development; (3939/Reso. 7745)

(d) Are constructed or composed of architectural-grade materials such as ceramic tile, metal, glass, or masonry. (3939/Reso. 7745)

17. Electronic message displays are permitted in accordance with the following: (4105)

(a) Displays of static messages, where the message change sequence is accomplished immediately or by means of fade or dissolve modes, shall be permitted as a matter of right, subject to the sign size limitations otherwise applicable for the site, provided each message is displayed for a minimum period of one (1) hour. (4105,4193)

Exception: In the Town Center Redevelopment Area such display is allowed only after approval of a Special Use Permit. (4105,4193)

Exception: On a freeway landmark monument, such display is allowed only after approval of a Council Use Permit. (4193)

(b) A Special Use Permit under the Administration and Procedures chapter of this Title shall be required for approval of the display of static messages displayed for a minimum period less than one (1) hour, and changed by any mode, or for message changes accomplished by the means of travel or scrolling modes. The Zoning Administrator/Board of Adjustment may attach conditions to the approval of such electronic message displays, including limitation on the minimum time period for the display of each message, to the extent necessary to ensure that the granting of the Special Use Permit will not have a detrimental effect on the surrounding area or the public welfare, and will be consistent with the purpose and intent of this Chapter. In making this determination, the Zoning Administrator/Board of Adjustment shall consider the following factors: (4105)

(1) The speed and volume of the vehicular traffic visually exposed to the sign; (4105)

(2) The presence of other signs or distracting influences in proximity to the sign location; and (4105)

(3) The extent to which the design of the sign is compatible with other signs located on the premises. (4105)

Exception: On a freeway landmark monument, such display is allowed only after approval of a Council Use Permit. (4193)

(c) The intensity of the LED display shall not exceed the levels specified in the chart below: (4193)

INTENSITY LEVEL (NITS)		
COLOR	DAYTIME	NIGHTTIME
Red Only	3,150	1,125
Green Only	6,300	2,250
Amber Only	4,690	1,675
Full Color	7,000	2,500

(4193)

Prior to the issuance of a sign permit, the applicant shall provide a written certification from the sign manufacturer that the light intensity has been factory pre-set not to exceed the levels specified in the chart above, and the intensity level is protected from end-user manipulation by password-protected software or other method as deemed appropriate by the Building Safety Director. (4193)

18. A freeway landmark monument is permitted in all zoning districts, subject to the approval of a Council Use Permit in accordance with the Administration and Procedures chapter of this Title. In addition to the findings required for approval of a Council Use Permit as specified in the definition contained in Section 11-1-6 of this Title, a freeway landmark monument may be approved only upon a finding by the City Council that such freeway landmark monument is in compliance with the locational parameters, operational limits, and design standards specified in the Freeway Landmark Monument Guidelines. (4193)

    Prior to any approval by the City Council of a proposed freeway landmark monument, such proposal shall first be reviewed by the Design Review Board who shall forward its recommendations to the City Council. Such review by the Design Review Board shall be limited to consideration of specific design, materials, and architectural features of the proposed freeway landmark monument. (4193)

(E) Sign Permits. (3939/Reso. 7745)

1. Except as provided in 11-19-8(B), it shall be unlawful for any person to place, display, alter, or relocate a sign without first obtaining a permit or permits from the Building Safety Director. All signs shall conform to the following design standards. (3939/Reso. 7745,4270)

   (a) Signs should be compatible with the style and character of the development and should be an integral design component of the building architecture, landscaping, and overall site development. (3939/Reso. 7745)

      (1) Attached Signs. Attached signs should be integrated with the primary physical features of the building and should not be incongruous to the building architecture. Signs should be composed of individual letters such as pan channel, or other durable material, and should be mounted so that the attachment device is not visible or discernible. (3939/Reso. 7745)

      (2) Detached Signs. Freestanding signs should incorporate design features associated with the buildings or structures, and should constitute an architectural component of the overall development. (3939/Reso. 7745)

   (b) Sign structures should be monument-style with a base of metal or masonry construction. (3939/Reso. 7745)

   (c) Exterior materials, finishes, and colors should be the same or similar to those of the building or structures on site. (3939/Reso. 7745)

   (d) The sign structure should reflect the general architectural style or design theme of the development. (3939/Reso. 7745)

   (e) Embellishment should be used as a method to incorporate the primary design elements or unique architectural features of the buildings or structures. (3939/Reso. 7745)

   (f) The sign copy area should not exceed a horizontal- to-vertical ratio of two to one (2:1). (3939/Reso. 7745)

Minneapolis (Minnesota), City of. 2008. *Zoning Code*.

Chapter 520. Introductory Provisions
520.160. Definitions.
Animated sign. A sign with a progression of frames which give the illusion of motion, moving objects, moving patterns or bands of lights and shapes; or that gives the visual impression of movement.

Flashing sign. A sign which exhibits changing light or color effect by any means, so as to provide intermittent illumination or the illusion of intermittent flashing light by any means. Also, any mode of lighting which resembles zooming, twinkling or sparkling.

Chapter 543. On-Premise Signs
Article I. General Provisions.

543.50. Prohibited signs. The following signs shall be prohibited in all zoning districts, except as otherwise specified in this chapter:
(1) Flashing signs, except in the downtown districts and C3A District, or when used to provide time and temperature, subject to the provisions of section 543.230, or when allowed on theaters, as specified in section 543.180.

Article IV. Special Provisions For Specific Uses.

543.185. Museums. Notwithstanding any other provision to the contrary, on-premise flashing wall or window signs may be allowed on museums of at least one hundred thousand (100,000) square feet (in those districts where museums are allowed) when approved as a sign adjustment pursuant to Chapter 543, On-Premise Signs, and Chapter 525, Administration and Enforcement.
(2004-Or-028, § 1, 3-19-04)

Article V. Special Provisions For Specific Types Of Signs.

543.230. Flashing signs.

(a) *Downtown districts.* Flashing signs shall be allowed in the downtown districts, provided flashing signs containing changing written messages shall be limited to the news, weather, time or other public service messages, except signs regulated by the sign standards for the Downtown Entertainment Area, provided further that the vertical dimension of such changing written message shall not exceed four (4) feet, except signs regulated by the sign standards for the Downtown Entertainment Area. Other flashing signs shall comply with the sign regulations for the district in which the sign is located.

(b) *C3A district.* Flashing signs shall be allowed, except that flashing signs containing changing written messages shall be limited to time and temperature only.

(c) *All other commercial districts.* Flashing signs shall be limited to the time and temperature only and shall comply with the sign regulations for the district in which

Used with permission.

they are located, but in no case shall the vertical dimension of such sign exceed two (2) feet.
(2001-Or-016, § 2, 2-2-01)

Chapter 544. Off-Premise Advertising Signs And Billboards

Article I. General Provisions.

544.10. Purpose. Regulations governing off-premise advertising signs and billboards are established to minimize the visual blighting effects caused by off-premise advertising signs and billboards by regulating their location, size, height and spacing, luminance and frequency of image change; to encourage the removal of signs and billboards that do not conform to the regulations of this chapter; and to protect the public health, safety and welfare. (2008-Or-027, § 1, 4-4-08)

544.20. General provisions. The following provisions shall apply to all off-premise signs, except as otherwise provided:

(13) *Flashing or animated off-premise signs.*

a. *Downtown Entertainment Billboard District.* Flashing, blinking, and/or animated off-premise signs, including but not limited to traveling lights or other means not providing constant illumination, shall be permitted in the downtown entertainment billboard district.

b. *Downtown Entertainment Area.* Flashing off-premise signs shall be permitted in this area provided the messages and/or imagery are displayed in a static manner for a minimum of eight (8) seconds. Animated off-premise signs shall be prohibited in the downtown entertainment area. The area consisting of those properties with frontage along the north side of Hennepin Avenue between Tenth Street and Fifth Street, and those properties with frontage along the south side of Hennepin Avenue between Ninth Street and Sixth Street shall be considered the downtown entertainment area for purposes of this section.

c. *Downtown Opportunity Billboard District.* Flashing and/or blinking off-premise signs shall be permitted in the Downtown Opportunity Billboard District provided that outside the Downtown Entertainment Billboard District and Downtown Entertainment Area flashing signs containing changing written messages shall be limited to the news, weather, time or other public service message with a vertical dimension that shall not exceed two (2) feet.

d. *Limited Access Roadway Opportunity Billboard District.* Flashing off-premise signs shall be permitted in this area, only on Interstate 94, north of Broadway, and on Interstate 35-W, north of Hennepin, provided (i) the messages and/or imagery are displayed in a static manner for a minimum of eight (8) seconds, and (ii) flashing signs shall be a minimum of two thousand five hundred (2,500) feet from any other off-premise flashing sign reading to the same directional traffic. The credits required pursuant section 544.60(c) for any flashing off-premises signs to be located in this area shall be demonstrated by the applicant to have been removed only from the area located north of the following: from the western boundary of the city along Broadway Avenue North (including signs on both sides of Broadway) thence to the northeasterly bank of the Mississippi River, thence along the northeasterly bank of

the River to Interstate 94, thence following the northern boundary of the right-of-way of Interstate 94 to the easterly boundary of the city.

544.30. Nonconforming off-premise signs. The following provisions shall apply to nonconforming off-premise signs:

(1) Off-premise signs lawfully existing at the time of adoption of this chapter which do not conform to the regulations of this chapter may continue to exist, but shall not be enlarged, relocated, or altered to include electronic lighting devices, except in compliance with this chapter.

(2) Maintenance and repair, including replacement, restoration, improvement, and changing of off-premise sign messages is allowed. Conversion of an existing non-conforming off-premise sign shall be subject to provisions of this chapter. Following damage or destruction, replacement of a nonconformity shall mean that the off-premise sign face or sign structure, if reinstated with a nonconformity as allowed under the terms of this chapter, shall be reconstructed to match the conditions that preceded damage or destruction. Nonconformities that are completely or substantially reconstructed that include changes to the placement or design, including use of electronic elements or animation, of the off-premise sign face or sign structure shall be subject to section 531.50, Expansion or alteration of nonconforming uses and structures. A new painted wall sign with changed advertising copy or graphics painted over an existing painted wall sign shall be prohibited by this chapter.

(3) Off-premise signs and sign structures which are moved shall be brought into compliance with all applicable regulations of this chapter.

(4) A nonconforming off-premise sign which is damaged or destroyed by any cause or means to the extent that the cost of restoration exceeds one-half (1/2) of its replacement cost and no building permit for reconstruction or replacement of the nonconforming structure is applied for within one hundred eighty (180) days of date the property is damaged or destroyed, shall not be reconstructed except in conformity with all applicable regulations of this chapter. When a building permit to reconstruct or replace the nonconforming off-premise sign face or sign structure in its pre-existing design and not enlarge, relocate or expand the nonconforming off-premise sign face or sign structure is applied for within one hundred eighty (180) days of the date the property is damaged or destroyed, such permit shall be approved notwithstanding the cost of the restoration and its relationship to the market value of the structure. Use of electronic device or animation for these off-premise signs shall be subject to all applicable regulations of this chapter. Reasonable conditions may be imposed by the zoning administrator to mitigate any newly created impact on adjacent property.

(5) A nonconforming off-premise sign which is discontinued for a continuous period of one (1) year shall be deemed to be abandoned and may not thereafter be reestablished or resumed except in conformity with all applicable regulations of this chapter.
(2002-Or-019, § 1, 3-1-02; 2005-Or-139, § 1, 12-2-05; 2006-Or-018, § 1, 2-10-06; 2008-Or-027, § 3, 4-4-08)

544.40. More restrictive provisions to apply. If a provision of this chapter conflicts

with Chapter 109, Signs and Billboards, of the Minneapolis Code of Ordinances, or with any other ordinance or other provision of law, the more restrictive provision shall apply.

Article II. General Billboard District

544.50. General Billboard District. Off-premise signs shall be permitted along county-state aid roadways, municipal-state aid roadways and state trunk highways in all commercial and industrial zoning districts, subject to the standards in Table 544-1, General Billboard District Standards, and all other applicable regulations of this zoning ordinance.

Table 544-1 General Billboard District Standards
TABLE INSET:

General Billboard District	
Minimum commercial or industrial zoning	The off-premise sign shall be located within a minimum of one thousand three hundred twenty (1,320) feet of continuous commercial or industrial zoning along and parallel to both sides of the roadway from which the off-premise sign is intended to be read .
Minimum lot frontage	Fifty (50) feet; one (1) sign per zoning lot
Maximum sign area	Three hundred (300) square feet
Maximum sign height	The top of the off-premise sign shall not exceed twenty-five (25) feet above the roof. No off premise sign shall be placed on the roof of any building exceeding two (2) stories in height or where the roof is more than twenty-eight (28) feet above grade.
Lighted sign	Permitted subject to luminance regulation; not facing R or OR districts.
Luminance*	Maximum of seven thousand (7,000) nits from 6:00 a.m. to 9:00 p.m.; and maximum of five hundred (500) nits from 9:00 p.m. to 6:00 a.m.
Animated signs	Not Permitted
Flashing signs	Not Permitted
Freestanding signs	Permitted
Minimum sign spacing	Six hundred sixty (660) feet from a residence or office residence district; One thousand (1,000) feet from an off-premise sign on either side of the roadway.

*Luminance is the physical measure of brightness or light emanating from an object with respect to its size. The unit of measurement for luminance is nits, which is the total amount of light emitted from a sign divided by the surface area of the sign (candela per square meter).
(2008-Or-027, § 4, 4-4-08)

Article III. Opportunity Billboard Districts

544.60. Opportunity Billboard Districts. (a) *Establishment and restrictions.* This section establishes the following opportunity billboard districts:
(1) *Limited Access Roadway Opportunity Billboard District.* The Limited Access Roadway Opportunity Billboard District shall comprise areas within six hundred sixty (660) feet of limited access roadway where continuous commercial or industrial zoning extends at least one thousand three hundred twenty (1,320) feet along and parallel to the limited access roadway without interruption by a residence or office residence zoning district. The six hundred sixty (660) foot spacing distance shall be measured from the right-of-way for the limited access roadway perpendicular to the flow of traffic. Any off-premise sign constructed or structurally altered within six hundred sixty (660) feet from such limited access roadway shall comply with the provisions of this section and shall be subject to all applicable regulations of this zoning ordinance.
(2) *Downtown Opportunity Billboard District.* The Downtown Opportunity Billboard District shall comprise the area bounded by the Mississippi River, I-35W, I-94, and I-394/Third Avenue North (extended to the river), except that in no case shall an off-premise sign be constructed or structurally altered along or within three hundred (300) feet of either side of Nicollet Avenue between Washington Avenue and Ninth Street South, between LaSalle Avenue and Marquette Avenue from Ninth Street South to Grant Street, or north of Washington Avenue extending to the Mississippi River. Any off-premise sign constructed or structurally altered within the Downtown Opportunity Billboard District shall comply with the provisions of this section and subject to all applicable regulations of this zoning ordinance.

(b) *Opportunity Billboard District Standards.* Off-premise signs shall be permitted in the Opportunity Billboard Districts, subject to the standards in Table 544-2, Opportunity Billboard District Standards, and all other applicable regulations of this zoning ordinance. If a provision of one (1) district conflicts with a provision of another district, the more restrictive provision shall apply. The appropriate district standards shall be determined by the zoning administrator at the time of application for a permit to construct or structurally alter an off-premise sign .

(c) *Additional conditions.* Prior to issuance of a permit to construct or structurally alter any off-premise sign within any Opportunity Billboard District, the applicant shall remove, or establish to the satisfaction of the zoning administrator, nonconforming off-premise sign area credits equivalent to the removal of two (2) square feet of nonconforming off-premise sign face area from qualifying locations for each one (1) square foot of total off-premise sign face area proposed, pursuant to the provisions of section 544.80; or in the case of an electronic off-premise signs, the applicant shall remove, or establish to the satisfaction of the zoning administrator, nonconforming off-premise sign area credits equivalent to the removal of four (4) square feet of nonconforming off-premise sign face area from qualifying locations for each one (1) square foot of total off-premise sign face area proposed, pursuant to the provisions of section 544.80. Provided, if credits under this section were used to permit the initial establishment of the off-premise sign, the applicant shall be required to remove only two (2) additional square feet of nonconforming off-premise sign face area from a qualified location for each one (1) square foot proposed for conversion to a flashing off-premises sign.

Table 544-2 Opportunity Billboard District Standards
TABLE INSET:

	Downtown Opportunity Billboard District	Limited Access Roadway Opportunity Billboard District
Minimum commercial or industrial zoning	At least one thousand three hundred twenty (1,320) feet of continuous parallel commercial or industrial zoning along both sides of the roadway from which the off-premise sign is intended to be read	At least one thousand three hundred twenty (1,320) feet of continuous commercial or industrial zoning along and parallel to the limited access roadway from which the off-premise sign is intended to be read, or can be read
Minimum lot frontage	50 feet for an off-premise sign not exceeding three hundred (300) square feet; 100 feet for an off-premise sign over three hundred (300) square feet; one (1) off-premise sign per zoning lot	Fifty (50) feet for an off-premise sign not exceeding three hundred (300) square feet; one hundred (100) feet for an off-premise sign over three hundred (300) square feet; one (1) off-premise sign per zoning lot
Maximum off-premise sign area	Six hundred seventy-two (672) square feet plus up to twenty-five (25) percent temporary extension of the basic off-premise sign face	Six hundred seventy-two (672) square feet plus up to twenty-five (25) percent temporary extension of the basic off-premise sign face
Maximum off-premise sign height	The top of the off-premise sign shall not exceed thirty-five (35) feet above the roof. No off premise sign shall be placed on the roof of any building exceeding three stories in height or where the roof is more than forty (40) feet above grade.	35 feet from grade. If located on a roof, the top of the off-premise sign shall not exceed thirty-five (35) feet above the roof. No off premise sign shall be placed on the roof of any building exceeding three stories in height or where the roof is more than forty (40) feet above grade.*
Freestanding off-premise signs	Not Permitted	Permitted
Lighted sign	Permitted subject to luminance provision	Permitted subject to luminance provision
Luminance**	Maximum of seven thousand (7,000) nits from 6:00 a.m. to 9:00 p.m.; and maximum of five hundred (500) nits from 9:00 p.m. to 6:00 a.m.	Maximum of seven thousand (7,000) nits from 6:00 a.m. to 9:00 p.m.; and maximum of five hundred (500) nits from 9:00 p.m. to 6:00 a.m.
Flashing signs	Not Permitted except as provided in Section 544.20(13)	Not Permitted except as provided in Section 544.20(13)(d)
Animated signs	Not Permitted except as provided in Section 544.20(13)	Not Permitted

Minimum off-premise sign spacing	Two hundred (200) feet from a residence or office residence district one thousand (1,000) feet from an off-premise sign on the same side of the roadway	Six hundred (600) feet from a residence or office residence district located along and on the same side of the limited access roadway; one thousand (1,000) feet from an off-premise sign on the same side of the roadway two thousand five hundred (2,500) feet from an off-premise flashing sign reading to the same directional traffic

*A sign in excess of height limits may be allowed as a conditional use in the Limited Access Roadway Opportunity Billboard District, subject to the provisions of Chapter 525.
**Luminance is the physical measure of brightness or light emanating from an object with respect to its size. The unit of measurement for luminance is nits, which is the total amount of light emitted from a sign divided by the surface area of the sign (candela per square meter).
(2008-Or-027, § 5, 4-4-08)

544.70. Special downtown spacing provision. In order to allow structural alteration or reconstruction of existing off-premise signs in the Downtown Opportunity Billboard District that may not meet the one thousand (1,000) foot spacing requirement of the district, the required spacing between existing off-premise signs may be reduced by one (1) foot for each two (2) square feet, or four (4) square feet in case of electronic signs, of nonconforming off-premise sign face area removed by the applicant from qualifying locations, pursuant to the provisions of section 544.80. In no case may the required spacing be reduced to less than five hundred (500) feet. This special spacing provision applies only to existing off-premise sign locations in the Downtown Opportunity Billboard District and only where the structurally altered or reconstructed off-premise sign is located on or within one hundred (100) feet of the zoning lot where the original off-premise sign was located immediately before such alteration or reconstruction. This special spacing provision does not apply to any Limited Access Roadway Opportunity Billboard District or to any General Billboard District.
(2008-Or-027, § 6, 4-4-08)

544.80. Nonconforming sign area credits. The zoning administrator shall maintain an account of removals of nonconforming off-premise sign face area from qualifying locations, and shall maintain a record of such nonconforming off-premise sign area credits used. Removal of the off-premise sign face shall include removal of all parts of the sign structure, including footings, and shall include removal of all nonconforming off-premise signs on the affected zoning lot. Nonconforming off-premise sign area credits may be reserved and used only by the original owner of the credits within five (5) years of the removal of the nonconforming off-premise sign face area. Qualifying locations are: A location that is not any part of the Opportunity Billboard District.
(2008-Or-027, § 7, 4-4-08)

544.90. Downtown Entertainment Billboard District. (a) *Establishment and restrictions.* This section establishes the following Downtown Entertainment Billboard District:

(1) *Downtown Entertainment Billboard District.* The Downtown Entertainment Billboard District shall comprise the area bounded by the following streets: Commencing at the intersection of Sixth Street North and Hennepin Avenue, land that is south of Sixth Street North between Hennepin Avenue and Second Avenue North, east of Second Avenue between Sixth Street and Seventh Street North, north of Seventh Street North between First and Second Avenue North, First Avenue North between Seventh and Eighth Street North, Eighth Street North between First Avenue North, north of Eighth Street North between First Avenue North and Hennepin Avenue, and west of Hennepin Avenue between Sixth Street and Eighth Street North. Off-premise signs constructed in this district shall not be subject to the requirements of 544.60 and 544.70.

(b) *Additional conditions.* Off-premise signs lawfully existing at the time of the adoption of this ordinance shall not be included in the calculation of the total amount of off-premise signage allowed under Table 544-3 Downtown Entertainment Billboard District.

Table 544-3 Downtown Billboard Entertainment District

TABLE INSET:

	Downtown Entertainment District
Maximum off-premise sign area	The off-premise sign face shall not exceed the square footage equal to ten (10) times the building perimeter as measured at the foundation wall, subject to 544.90(b)
Maximum off-premise sign height	If located on a roof, the top of the off-premise sign shall not exceed fortuy-five (45) feet above the roof. No off premise sign shall be placed on the roof of any building exceeding four stories in height or where the roof is more than fifty-six (56) feet above grade.*
Lighted signs	Permitted subject to luminance provision.
Freestanding signs	Not Permitted.
Luminance*	Maximum of seven thousand (7,000) nits from 6:00 a.m. to 9:00 p.m.; and maximum of five hundred (500) nits from 9:00pm to 6:00 a.m.
Animated signs	Permitted
Flashing signs	Permitted
Minimum sign spacing	None.

*Luminance is the physical measure of brightness or light emanating from an object with respect to its size. The unit of measurement for luminance is nits, which is the total amount of light emitted from a sign divided by the surface area of the sign (candela per square meter).

(Ord. No. 2006-Or-105, § 1, 9-22-06; 2008-Or-027, § 8, 4-4-08)

Seattle (Washington), City of. 2008. *Land Use Code.*

Subtitle III Land Use Regulations.
Division 2. Authorized Uses and Development Standards.
Chapter 23.55 Signs

23.55.003. Signs prohibited in all zones.

A. The following signs shall be prohibited in all zones:

1. Flashing signs;

2. Signs which rotate or have a rotating or moving part or parts that revolve at a speed in excess of seven (7) revolutions per minute;

7. Signs using a video display method, except as provided in section 23.55.005, Video display methods.

(Ord. 120466 Section 1, 2001; Ord. 112830 Section 10(part), 1986.)

23.55.005. Video display methods.

A. Development standards. Video display may be used on a sign when the sign meets all of the following development standards:

1. The sign is an on-premises sign;

2. The sign is not located in a residential, NC1 or NC2 zone, Special Review District, Historical District, Preservation District or shoreline environment;

3. The sign meets one of the following criteria:

i. The sign face is not visible from a street, driveway or surface parking area, and also is not visible from a lot that is owned by a different person, in which case the size of the sign is not limited by this subsection, and the standards for duration or pause periods and subsection A5 shall not apply; or

ii. The sign area is less than or equal to one thousand (1000) square inches and no single dimension of the sign exceeds three (3) feet; or

iii. The sign meets the standards set out in subsection B, in addition to meeting all other standards of this subsection A.

4. The maximum height for any sign using a video display method shall be fifteen (15) feet above existing grade. Pole signs using a video display method shall be at least ten (10) feet above the ground;

5. The sign is at least thirty-five (35) linear feet in any direction from any other sign that uses a video display method;

6. When located within fifty (50) feet of a lot in a residential zone, any part of the sign using a video display method is oriented so that no portion of the sign face is visible from an existing or permitted principal structure on that lot;

7. Duration: Any portion of the message that uses a video display method shall have a minimum duration of two (2) seconds and a maximum duration of five (5) seconds. Calculation of the duration shall not include the number of frames per second used in a video display method. Calculation of the maximum duration shall include the time used for any other display methods incorporated within that portion of the message displayed using a video display method;

8. Pause Between Video Portions of Message. There shall be twenty (20) seconds of still image or blank screen following every message using a video display method;

9. Audio speakers shall be prohibited in association with a sign using a video method of display;

10. Between dusk and dawn the video display shall be limited in brightness to no more than five hundred (500) units when measured from the sign's face at its maximum brightness; and

11. Signs using a video display method may be used after dusk only until 11:00 p.m. or, if the advertising is an on-premises message about an event at the site where the sign is located, for up to one (1) hour after said event.

B. In lieu of complying with subsection A3 above, the Director of DPD shall allow video display methods on a sign if the sign meets all of the following additional development standards:

1. The sign is within the area shown on the map attached as Exhibit 23.55.005 A and not within a Special Review District, Historic District, Preservation District, residential zone or shoreline environment;

2. The sign is a minimum distance of fifteen (15) feet from the curb; and

3. The maximum size of the sign is twenty (20) square feet as independently applied to each sign face, including framework and border.

C. Video Signs Previously Erected. On-premises signs using the video method of display, that have permits authorizing use of that method of display issued prior to August 1, 2001, may continue to use the video method of display authorized in the permit provided that they meet the standards of 23.55.005A6-11 above within one hundred eighty (180) days from the effective date of the ordinance codified in this section. Previously erected and permitted signs that use a video method of display located within the area shown on the map attached as Exhibit A shall not be subject to the foregoing standards of this section except 23.55.005Al. If the video method of display is terminated for one hundred eighty (180) days or the sign is relocated or reconstructed, then the video method of display cannot be used except in conformance with the development standards of this section.

(Ord. 121477 Section 34, 2004; Ord. 120466 Section 2, 2001.)

23.55.015. Sign kiosks and community bulletin boards.

C. Development Standards for Sign Kiosks.

1. Design and Construction.

e. Lights, changing image signs, and message board signs shall not be placed on any part of a sign kiosk that is visible from the street. Flashing signs and chasing signs are prohibited on any part of a kiosk. Any lighting fixtures used within kiosks or used externally to illuminate kiosks shall be fully shielded. The maximum illumination level at the kiosk shall be five (5) foot-candles (fc) maintained at ground level.

Part 2. Standards for Specific Zones.

23.55.020. Signs in single-family zones.

A. Signs shall be stationary and shall not rotate.

B. No flashing, changing-image or message board signs shall be permitted.

23.55.022. Signs in multi-family zones.

A. Signs shall be stationary and shall not rotate.

B. No flashing, changing-image or message board signs shall be permitted.

23.55.028. Signs in NC1 and NC2 zones.

A. Signs shall be stationary and shall not rotate, except for barber poles.

B. Signs may be electric, externally illuminated, or nonilluminated.

C. No flashing, changing-image or chasing signs shall be permitted, except that chasing signs for motion picture and performing arts theaters shall be permitted in NC2 zones.

23.55.030. Signs in NC3, C1, C2 and SM zones.

A. No sign shall have rotating or moving parts that revolve at a speed in excess of seven (7) revolutions per minute.

B. Signs may be electric, externally illuminated, nonilluminated or may use video display methods when the sign meets the development standards in Section 23.55.005, Video display methods.

C. No flashing signs shall be permitted.

23.55.034. Signs in downtown zones.

C. General Standards for All Signs.

1. Signs may be electrical, externally illuminated, nonilluminated or may use video display methods when the sign meets the development standards in Section 23.55.005, Video display methods.

2. No sign shall have rotating or moving parts that revolve at a speed in excess of seven (7) revolutions per minute.

3. No flashing signs shall be permitted.

23.55.036. Signs in IB, IC, IG1 and IG2 zones.

A. No sign shall have rotating or moving parts that revolve at a speed in excess of seven (7) revolutions per minute.

B. Signs may be electric, externally illuminated, or nonilluminated or may use video display methods when the sign meet the development standards in Section 23.55.005, Video display methods.

C. No flashing signs shall be permitted.

23.55.040. Special exception for signs in commercial and downtown zones.

The Director may authorize exceptions to the regulations for the size, number, type, height and depth of projection of on-premises signs in neighborhood commercial, commercial, downtown office core, downtown retail core, downtown mixed commercial and downtown harborfront zones as a special exception pursuant to Chapter 23.76, Procedures for Master Use Permit and Council Land Use Decisions, except that no special exception may be authorized for a sign using video display methods. When one (1) or more of the conditions in subsection A of this section have been met, the characteristics described in subsection B of this section shall be used to evaluate the merits of the proposal. Proposals must also meet the intent of the Sign Code as specified in Section 23.55.001, Intent. An exception shall not be granted for roof signs or signs prohibited in Section 23.55.003. In downtown zones, the Director shall consult with the Seattle Design Commission before issuance of the special exception decision.

Subtitle IV. Administration.
Division 2. General Terms.
Chapter 23.84. Definitions.
23.84.036 Definitions - S.

"Sign, changing-image" means a sign, including a sign using a video display method, which changes its message or background by means of electrical, kinetic, solar or mechanical energy, not including message board signs. A video display method is a method of display characterized by real-time, full-motion imagery of at least television quality.

"Sign, chasing" means a sign which includes one (1) or more rows of lights which light up in sequence.

"Sign, flashing" means an electrical sign or portion of an electrical sign which changes light intensity in sudden transitory bursts. Flashing signs do not include changing image or chasing signs.

"Sign, message board" means an electric sign which has a readerboard for the display of information, such as time, temperature, of public service or commercial messages, which can be changed through the turning on and off of different combinations of light bulbs within the display area.

Municipalities - Population Between 25,000 and 100,000

Bloomington (Minnesota), City of. 2008. *City Code*.

Chapter 19. Zoning

Article VI. Billboards.
Section 19.66. Billboards.

(b) Billboards in the General Industrial, (I-3) Freeway Development (FD-2) and Commercial Service (CS-0.5 and CS-1) Districts -

(3) No animation is permitted on billboards;

(19) No billboard or portion thereof may turn on an axis, rotate, revolve or otherwise physically move;

(20) Electronic display techniques include any portion of a billboard that contains alphanumeric characters, graphics or symbols defined by a small number of matrix elements using different combinations of light emitting diodes (LED's), fiber optics, light bulbs or other illumination device within the display area, including computer programmable, microprocessor controlled electronic displays and projected images or messages with these characteristics onto the sign face; and

(21) Any billboard utilizing electronic display techniques in whole or in part must meet the following operational standards:

(A) Duration. In all districts the full billboard image or any portion thereof must have a minimum duration of 20 minutes and must be a static display. No portion of the image may flash, scroll, twirl, change color, in any manner imitate movement, or meet the characteristics of a flashing sign as defined in Section 19.104;

(B) Transition. In all districts where the full billboard image or any portion thereof changes, the change sequence must be accomplished by means of instantaneous re-pixalization;

(C) Brightness. The sign must not exceed a maximum illumination of 5,000 nits (candelas per square meter) during daylight hours and a maximum illumination of 500 nits (candelas per square meter) between dusk to dawn as measured from the sign's face at maximum brightness;

(D) Dimmer control. Electronic graphic display signs must have an automatic dimmer control to produce a distinct illumination change from a higher illumination level to a lower level for the time period between one half-hour before sunset and one half-hour after sunrise;

(E) Audio or pyrotechnics. Audio speakers or any form of pyrotechnics as defined in Section 19.104 are prohibited in association with a billboard;

(F) Fluctuating or Flashing Illumination. No portion of any billboard may fluctuate in light intensity or use intermittent, strobe or moving light or light that changes in intensity in sudden transitory bursts, streams, zooms, twinkles, sparkles or in any manner creates the illusion of movement; and

Used with permission of the Planning and Economic Development Department, City of Bloomington.

(G) Video display. No portion of any billboard may change its message or background in a manner or by a method of display characterized by motion or pictorial imagery, or depicts action or a special effect to imitate movement, or the presentation of pictorials or graphics displayed in a progression of frames that give the illusion of motion or the illusion of moving objects, moving patterns or bands of light or expanding or contracting shapes.

Article X. Sign Regulations.
Division B. Construction of Language and Definitions
Section 19.104. Definitions.

The following words and terms, when used in this Article, shall have the following meanings, unless the context clearly indicates otherwise:

Changeable copy sign - a sign or portion thereof which has a readerboard for the display of text information in which each alphanumeric character, graphic or symbol in defined by objects, not consisting of an illumination device and may be changed or re-arranged manually or mechanically with characters, letters, or illustrations that can be changed or rearranged without altering the face or the surface of the sign.

Changeable copy sign, electronic - a sign or portion thereof that displays electronic, non-pictorial, text information in which each alphanumeric character, graphic, or symbol is defined by a small number of matrix elements using different combinations of light emitting diodes (LED's), fiber optics, light bulbs or other illumination devices within the display area. Electronic changeable copy signs include computer programmable, microprocessor controlled electronic displays. Electronic changeable copy signs do not include official or time and temperature signs. Electronic changeable copy signs include projected images or messages with these characteristics onto buildings or other objects.

Electronic graphic display sign - a sign or portion thereof that displays electronic, static images, static graphics or static pictures, with or without information, defined by a small number of matrix elements using different combinations of light emitting diodes (LED's), fiber optics, light bulbs or other illumination devices within the display area where the message change sequence is accomplished immediately or by means of fade, repixalization or dissolve modes. Electronic graphic display signs include computer programmable, microprocessor controlled electronic or digital displays. Electronic graphic display signs include projected images or messages with these characteristics onto buildings or other objects.

Flashing sign - a directly or indirectly illuminated sign or portion thereof that exhibits changing light or color effect by any means, so as to provide intermittent illumination that changes light intensity in sudden transitory bursts and creates the illusion of intermittent flashing light by streaming, graphic bursts showing movement, or any mode of lighting which resembles zooming, twinkling, or sparkling.

Illuminated sign - any sign which contains an element designed to emanate artificial light internally or externally.

Message center - see Changeable Copy Sign.

Multi-vision sign - any sign composed in whole or in part of a series of vertical or horizontal slats or cylinders that are capable of being rotated at intervals so that partial rotation of the group of slats or cylinders produces a different image and when properly functioning allows on a single sign structure the display at any given time one of two or more images.

Rotating sign - a sign or portion of a sign which in any physical part or in total turns about on an axis, rotates, revolves or is otherwise in motion, including without limitation a multi-vision sign.

Time and temperature sign - any sign which displays exclusively current time and temperature information.

Video display sign - A sign that changes its message or background in a manner or method of display characterized by motion or pictorial imagery, which may or may not include text and depicts action or a special effect to imitate movement, the presentation of pictorials or graphics displayed in a progression of frames which give the illusion of motion, including but not limited to the illusion of moving objects, moving patterns or bands of light, or expanding or contracting shapes, not including electronic changeable copy signs. Video display signs include projected images or messages with these characteristics onto buildings or other objects.

Division C. General Regulations
Section 19.106. Signs Prohibited In All Districts.

(b) **Prohibited Signs.**

(6) **Flashing Signs Prohibited.** Flashing signs not falling under the definition of video display signs are prohibited.

(7) **Shimmering Signs Prohibited.** Shimmering signs shall be prohibited.

(11) **Video Display Signs Prohibited.** Video display signs are allowed only as provided in Section 19.108(h)(5) of this City Code.

(12) **Electronic Changeable Copy Signs Prohibited.** Electronic changeable copy signs are allowed only as provided in Section 19.108(h)(4) of this City Code.

(13) **Electronic Graphic Display Signs Prohibited.** Electronic graphic display signs are allowed only as provided in Section 19.108(h)(6) of this City Code.

(14) **Signs with Fluctuating Illumination Prohibited.** Any type of sign that fluctuates in light intensity or uses intermittent, strobe or moving light or lights that does not fall under the definition of video display signs, electronic changeable copy signs or electronic graphic display signs is prohibited.

(15) **Multi-vision Signs Prohibited.** Multi-vision signs are allowed only as provided in Section 19.108(h)(7) of this City Code.

Section 19.108. General Provisions, Including Basic Design Elements.

(h) **Basic Design Elements for Specific Signs.**

(4) **Electronic Changeable Copy Sign.** Electronic changeable copy signs must meet the following standards. When attached to walls, electronic changeable copy signs are classified as cabinet signs.

(A) Location. The sign must be located on the site of the use identified or advertised by the sign;

(B) District Limitations. The sign must not be located in a Conservation or Bluff Overlay (BP-1, BP-2) district;

(C) Setback from residential. The leading edge of the sign in a non-residential zoning district must be a minimum distance of 100 feet from an abutting residential district boundary;

(D) Setback from other electronic changeable copy, electronic graphic display or video display signs. Electronic changeable copy signs must be separated from other electronic changeable copy signs, electronic graphic display signs or video display signs by at least 35 feet;

(E) Orientation. When located within 150 feet of a residentially-used lot in a residential zone, all parts of the electronic changeable copy sign must be oriented so that no portion of the sign face is visible from an existing or permitted principal structure on that lot;

(F) Duration. In non-residential districts (B-1, B-2, B-3, B-4, C-1, C-2, C-3, C-4, C-5, CR-1, CB, CS-0.5, CS-1, CO-0.5, CO-1, CO-2, CX-2, HX-R, HX-2, I-1, I-2, I-3, IP, FD-1, FD-2) any portion of the message must have a minimum duration of eight seconds and must be a static display. In residential districts (R-1, R-1A, RS-1, R-4, RM-12, RM-24, RM-50, RO-24, RO-50) any portion of the message must have a minimum duration of one hour and must be a static display. In all districts, no portion of the message may flash, scroll, twirl, change color, fade in or out or in any manner imitate movement;

(G) Color. In residential districts (R-1, R-1A, RS-1, R-4, RM-12, RM-24, RM-50, RO-24, RO-50) any portion of the message must use an amber color;

(H) Limited Text. The text of the sign must be limited to ten words to allow passing motorists to read the entire copy with minimal distraction; and

(I) Audio or pyrotechnics. Audio speakers or any form of pyrotechnics are prohibited in association with an electronic changeable copy sign.

(5) **Video Display Sign.** Video display signs must meet the following standards. When attached to walls, video display signs are classified as cabinet signs.

(A) Location. The sign must be located on the site of the use identified or advertised by the sign;

(B) District Limitations. The sign must not be located in a Residential (R-1, R-1A, RS-1, R-4, RM-12, RM-24, RM-50, RO-24, RO-50), Conservation, or Bluff Overlay (BP-1, BP-2) district;

(C) Setback from residential. The leading edge of the sign must be a minimum distance of 100 feet from an abutting residential district boundary;

(D) Setback from other electronic graphic display, electronic changeable copy or video display signs. Video display signs must be separated from other electronic graphic display, electronic changeable copy signs, or video display signs by at least 35 feet;

(E) Orientation. In all districts the video display sign must be oriented so that no portion of the sign face is visible from an existing or permitted principal structure on any residential lot; from any traveled highway, street, driveway or internal access way; from any park; or from a conservation or bluff district;

(F) Brightness. The sign must not exceed a maximum illumination of 5000 nits (candelas per square meter) during daylight hours and a maximum illumination of 500 nits (candelas per square meter) between dusk to dawn as measured from the sign's face at maximum brightness;

(G) Dimmer control. Video display signs must have an automatic dimmer control to produce a distinct illumination change from a higher illumination level to a lower level for the time period between one half-hour before sunset and one half-hour after sunrise; and

(H) Audio or pyrotechnics. Audio speakers or any form of pyrotechnics are prohibited in association with a video display sign.

(6) **Electronic Graphic Display Sign.** Electronic graphic display signs must meet the following standards. When attached to walls, electronic graphic display signs are classified as cabinet signs.

(A) Location. The sign must be located on the site of the use identified or advertised by the sign;

(B) District Limitations. The sign must not be located in a Conservation, Bluff Overlay (BP-1, BP-2) district or Residential district (R-1, R-1A, RS-1, R-4, RM-12, RM-24, RM-50, RO-24, RO-50);

(C) Setback from residential. The leading edge of the sign must be a minimum distance of 100 feet from an abutting residential district boundary;

(D) Setback from other electronic graphic display, electronic changeable copy or video display signs. Electronic graphic display signs must be separated from other electronic graphic display, electronic changeable copy signs, or video display signs by at least 35 feet;

(E) Orientation. When located within 150 feet of a residentially-used lot in a residential zone, any part of the electronic graphic display sign must be oriented so that no portion of the sign face is visible from an existing or permitted principal structure on that lot.

(F) Duration. In all districts any portion of the image must have a minimum duration of 20 minutes and must be a static display. No portion of the image may flash, scroll, twirl, change color, or in any manner imitate movement;

(G) Brightness. The sign must not exceed a maximum illumination of 5000 nits (candelas per square meter) during daylight hours and a maximum illumination of 500 nits (candelas per square meter) between dusk to dawn as measured from the sign's face at maximum brightness;

(H) Dimmer control. Electronic graphic display signs must have an automatic dimmer control to produce a distinct illumination change from a higher illumination level to a lower level for the time period between one half-hour before sunset and one half-hour after sunrise; and

(I) Audio or pyrotechnics. Audio speakers or any form of pyrotechnics are prohibited in association with an electronic graphic display sign.

(7) **Multi-vision Sign.** Multi-vision signs must meet the following standards. When attached to walls, multi-vision signs are classified as cabinet signs.

(A) Location. The sign must be located on the site of the use identified or advertised by the sign;

(B) District Limitations. The sign must not be located in a Conservation, Bluff Overlay (BP-1, BP-2) district or Residential district (R-1, R-1A, RS-1, R-4, RM-12, RM-24, RM-50, RO-24, RO-50);

(C) Setback from residential. The leading edge of the sign must be a minimum distance of 100 feet from an abutting residential district boundary;

(D) Setback from other multi-vision signs. Multi-vision signs must be separated from other multi-vision signs by at least 35 feet;

(E) Orientation. When located within 150 feet of a residentially-used lot in a residential zone, any part of the multi-vision sign must be oriented so that no portion of the sign face is visible from an existing or permitted principal structure on that lot;

(F) Duration. In all districts any image or message or portion thereof must have a minimum duration of eight seconds and must be a static display. Transition time must be no longer than two seconds;

(G) Default mechanism. All multi-vision signs must be equipped with a properly functioning default mechanism that will stop the sign in one position should a malfunction occur; and

(H) Audio or pyrotechnics. Audio speakers or any form of pyrotechnics are prohibited in association with a multi-vision sign.

(8) **Time and Temperature Sign.** Time and temperature signs must meet the following standards. When attached to walls, time and temperature signs are classified as cabinet signs.

(A) Location. The sign must be located on the site of the use advertised or identified by the sign;

(B) District Limitations. The sign must not be located in Residential (R-1, R-1A, RS-1, R-4, RM-12, RM-24, RM-50, RO-24, RO-50), Conservation or Bluff Overlay (BP-1, BP-2) district;

(C) Duration. Time and temperature signs must have a minimum display duration of two seconds that is static during each individual message. No portion of the message may flash, scroll, twirl, change color, fade in or out or in any manner imitate movement; and

(D) Audio or pyrotechnics. Audio speakers or any form of pyrotechnics are prohibited in association with a time and temperature sign.

(9) **Rotating Signs.**

(A) No sign shall have rotating or moving parts that revolve at a speed in excess of seven revolutions per minute.

SECTION 207

GENERAL SIGN REGULATIONS
(As amended by Ordinance Nos. O02-12-32, O03-06-11, O04-11-21, O05-06-09, O06-07-16 and O07-11-31)

These provisions are established as a reasonable and impartial method of regulating signs and similar advertising structures in order to insure light, air, and open space, to reduce hazards at intersections, to protect property values of the entire community, and to enhance the aesthetics of the community. In addition to regulations indicated for individual districts elsewhere in this Zoning Code, the following regulations apply in groups of districts or generally in all districts as specified:

SECTION 207.1 DEFINITIONS

For the purpose of this Section the following definitions shall apply for all districts:

SIGN. Outdoor graphics conveying or intended to convey some information, knowledge or idea to the public. The word "sign" includes the word "billboard" or any other type of advertising device. For the purposes of installation and removal, sign shall also include all sign structures. (As amended by Ordinance No. O02-12-32)

This definition shall not include festival or holiday decorations; the noncommercial use of a flag, emblem, insignia, or other display of any nation or political subdivision; traffic, safety or similar regulatory devises; legal notices; scoreboards; memorial signs or tablets; emblems of religious institutions that are attached to buildings; and customary displays of merchandise or objects and materials placed behind a store window.

Examples of several types of signs are depicted on Illustration 15 in Section 235 of this Zoning Code.

ABANDONED OR OBSOLETE SIGN. A sign either on-premise or off-premise, which identifies, describes, directs attention to, or gives directions for locating any business or establishment no longer in operation, or advertises any product no longer being marketed or any sign structure lacking sign face or sign copy.

AWNING, CANOPY, OR MARQUEE SIGN. A sign painted, stamped, perforated or stitched, or otherwise applied on the valance of an awning.

BANNER SIGN. A sign usually of cloth, paper, plastic or other non-rigid material with no enclosing framework that is fastened or otherwise attached to support structures spanning horizontally and overhanging an area and generally temporary in nature.

BILLBOARD SIGN. A sign which directs attention to a business, commodity, service or entertainment conducted, sold or offered at a location other than the premises on which the sign is located.

Used with permission of the City of Cookeville Planning Department.

CHANGEABLE COPY SIGN (READER BOARD). A sign on which copy is changed manually in the field, i.e., reader boards with changeable letters. (As amended by Ordinance No. O02-12-32).

CONSTRUCTION SIGN. A sign erected during the construction of a building or other type of improvement, customarily listing the name of the owner, architect, engineer, designer, and/or contractors involved in the construction of said building or improvement.

DIRECTIONAL SIGN. An on-premise sign giving directions, instructions, or facility information, such as parking, loading, entrance, or exit.

ELECTRONIC DISPLAY SCREEN. A sign, or portion of a sign, that displays an electronic image or video, which may or may not include text. This definition includes television screens, plasma screens, digital screens, flat screens, LED screens, video boards, and holographic displays. (As amended by Ordinance No. O02-12-32).

ELECTRONIC MESSAGE CENTER. Any sign or portion of a sign that uses changing lights to form a sign message or messages in text form wherein the sequence of messages and the rate of change is electronically programmed and can be modified by electronic processes. (As amended by Ordinance No. O02-12-32).

FASCIA SIGN. A sign attached directly to the fascia of a building.

FENCE SIGN. A sign that is fastened to or painted on a fence in such a manner that the fence becomes the supporting structure for, or forms the background surface of the sign. (As amended by Ordinance No. O03-06-11)

FLASHING SIGN. A sign, the illumination of which is intermittently on and off so as to flash or blink or the intensity varies so as to appear to flash or blink. Such signs are prohibited.

FREESTANDING SIGN. Any nonmovable sign not affixed to a building, including ground, pole or similar signs.

GARAGE OR YARD SALE SIGN. A sign either on-premise or off-premise, which identifies, describes, directs attention to, or gives direction for locating a garage sale or yard sale.

ILLUMINATED SIGN. A sign that is illuminated by electric or other devices for night visibility.

LEADING EDGE. The first vertical edge of a sign as measured in a straight line from the nearest street right-of-way or property line, or as determined by the Building Official.

MANSARD SIGN. A sign attached to a roof-like façade architecturally comparable to a building wall. For the purpose of these regulations the area of the mansard shall be determined by multiplying the width and the total vertical height, ignoring any slope. (As amended by Ordinance No. O02-12-32).

MENU BOARD. A sign associated with drive-through windows that is not over thirty-two (32) square feet and oriented toward drive-through traffic. A permit is required, but such sign shall not be counted toward the freestanding sign allowance.

MOBILE OR PORTABLE SIGN. A sign which is designed to be readily transportable from place to place, not permanently attached to a footer or masonry foundation, or any such sign, which generally meets this criteria, as shall be determined by the Building Official to be a mobile or portable sign.

MULTI-PRISM SIGN. An off-premise sign made with a series of triangular sections that rotate and stop, or index, to show three (3) images or messages in the same area at different times. (As amended by Ordinance No. O02-12-32).

OFF-PREMISE SIGN. A sign which advertises goods, services, facilities, events or attractions available at a location other than the premises where the sign is located.

ON-PREMISE SIGN. A sign other than an off-premise sign. (As amended by Ordinance No. O05-06-09).

POLITICAL SIGN. A temporary sign designed to attract support for a particular candidate, political party, or political issue or to express an opinion on any matter of public interest. (As amended by Ordinance No. O05-06-09).

PREMISES. A lot of record as defined by the Cookeville Municipal Code.

PROJECTING SIGN. A sign that is wholly or partly dependent upon a building for support and which projects more than one (1) foot from such building.

REAL ESTATE SIGN. A sign advertising the sale, auction, rent or lease of the premises on which it is located.

ROOF SIGN. Any sign erected or maintained upon or attached to a roof of a building. (As amended by Ordinance No. O02-12-32).

SIGN FACE AREA. The portion of a sign structure intended to convey information, knowledge or idea to the public, exclusive of the frame or support structure. Includes the terms sign panel and sign copy. For the purpose of these regulations, total sign face area shall include all signs on any individual structure. The following provisions shall apply for determining sign face area:

1. The area of a FASCIA, MANSARD, ROOF, or WALL SIGN shall be the area of the smallest rectangle that will enclose the sign face. If the sign is composed of individual letters or symbols using the fascia, mansard roof, or wall as a background with no added decoration, the total sign face area shall be the sum of the areas of the smallest rectangles that enclose each individual letter or symbol.

2. The area of a FREESTANDING SIGN shall be the area of the smallest rectangle that will enclose the sign face. For a sign with two (2) parallel faces, only the area of a single face shall be considered. If the faces of a multiple-faced sign area not parallel, then the total sign face area shall be the sum of the areas of the individual, non-parallel sign faces.

SIGN STRUCTURE. Any structure, vehicle, trailer or any other object or device that supports, has supported, or is capable of supporting a sign. (As amended by Ordinance No. O02-12-32).

TEMPORARY SIGN. Any sign which by reason of construction or purpose intended to be displayed for a short period of time.

UNDER-AWNING SIGN. A sign located under a permitted awning or canopy at the entrance to the premises. Such sign shall only identify on the name of the business or premises and shall be perpendicular to the entrance wall of the building.

VEHICLE OR TRAILER SIGN. A permanent or temporary sign affixed, painted on, or placed in or on any vehicle, trailer, or other device capable of being driven or towed, which is displayed in public view so that the primary purpose is to attract the attention of the public, rather than to serve the business of the owner thereof in a manner which is customary for said vehicle or trailer. (As amended by Ordinance No. O02-12-32).

WALL SIGN. A sign fastened to or painted on the wall of a building or structure in such a manner that the wall becomes the supporting structure for, or forms the background surface of the sign, and which does not project more than one (1) foot from such building or structure. For the purpose of these regulations a wall shall be considered as the first perpendicular surface originating from ground level.

An individual sign may fall under more than one of the above definitions, e.g., illuminated free-standing on-premise sign, temporary off-premise sign, etc.

SECTION 207.2 SIGN PERMIT REQUIRED

For all signs allowed in any residential, commercial or industrial zoning district as shown on the Official Zoning Map of the City of Cookeville, Tennessee or with any residential, commercial or industrial use, the following regulations unless otherwise noted herein shall apply:

207.2A An application for a sign permit shall be submitted to the Department of Planning and Codes on forms furnished by said department and approved prior to the erection, relocation, major alteration or modification of any sign located in the City of Cookeville.

The replacement of a sign head, addition of an electronic message center, or conversion to a multi-prism or electronic display screen on any existing sign shall be classified as a major alteration or modification which requires a sign permit as herein specified. (As amended by Ordinance No. O06-07-16)

207.2B The application for a sign permit shall contain the following information:

1. Name, address and telephone number of applicant.
2. Location of building, structure or lot to which or upon which the sign is to be located.
3. Affidavit from property owner, if different from sign owner, indicating approval for sign location.
4. Name of person, firm, corporation or association that will be erecting the sign. A licensed contractor is required for the erection of all signs if applicable under the provisions of TCA Section 62-6-103 through 138. (As amended by Ordinance No. O07-11-31)
5. Evidence of liability insurance policy or bond responsibility for sign erection.
6. Brief description, sketch or drawing of the proposed sign, including all dimensions and estimated cost.
7. Evidence of setback compliance for all freestanding sign structures. Determination of setbacks shall be as specified in Section 204.17 of this Zoning Code.
8. Engineered drawings for any sign exceeding twenty (20) feet in height or one hundred fifty (150) square feet in sign face area. Engineered drawings may be required for other signs if determined as necessary by the Building Official.
9. Evidence of receipt of Electrical Inspection Permit for any sign requiring electrical power (issued by Cookeville Electric Department) and evidence of such sign being approved and stamped by Underwriters Laboratory (UL number shall be provided).

207.2C FEES (As amended by Ordinance No. O05-06-09)

A sign permit fee shall be submitted to the Department of Planning with the application for the sign permit. The permit fee shall be based on the square footage of sign face area, per sign face, as follows:

1. 100 square feet or less of sign face area: $0.25 per square foot with a minimum fee of $15.00

For all zoning districts as shown on the Official Zoning Map of the City of Cookeville, Tennessee the following regulations for signs and similar advertising structures shall apply:

207.3A No sign shall be located in such a manner so as to obstruct free or clear vision, or otherwise cause hazards for vehicular or pedestrian traffic by reason of location, shape, illumination or color.

207.3B No sign shall be erected, replaced or relocated so as to prevent free use of any required door, window, fire escape, emergency exit or standpipe.

207.3C No sign shall be located on, or attached to, any public property except public signs authorized by the City of Cookeville or the State of Tennessee.

207.3D No sign shall be located on or overhanging any public rights-of-way, except for certain signs specifically permitted in the CBD District (see Section 207.6K of this Zoning Code).

207.3E Setbacks for all signs shall be measured from the leading edge of the sign as determined by the Building Official.

207.3F No sign shall be painted or attached to any trees, rocks, utility poles, guy wires, street name signs, warning and regulatory signs, and the like.

207.3G No sign shall have blinking, flashing, or fluttering lights or other illuminating device that has a changing light intensity, brightness, or color. Signs or portions of signs designed primarily for the display of time and temperature and on premise electronic message centers are specifically excluded from the provisions of this paragraph.

207.3H No sign shall be placed in such a manner as to impede visibility between a height of two (2) feet and ten (10) feet above street level of intersecting streets at their point of intersection in an area defined by the street lines adjoining the corner lot and a line joining points along said street lines fifty (50) feet from the point of intersection.

207.3I All signs designed or equipped to be connected to electricity in any way shall be approved and stamped by Underwriters Laboratory, and shall not be connected to any source of electrical power until such connection meets all applicable city and state codes.

207.3J All signs shall be erected, replaced, or relocated in accordance with the City of Cookeville Building Codes.

207.3K (As amended by Ordinance No. O02-12-32) The following provisions shall apply for all vehicle or trailer signs:

207.6A All signs allowed in Residential Districts, subject to the same regulations, are allowed.

207.6B Each commercial and industrial premise with less than 400 feet of frontage on any one (1) public street, regardless of the number of commercial or industrial establishments on such premise, shall be allowed one (1) on-premise freestanding business sign structure per public street frontage, but in no case shall more than two (2) freestanding sign structures be permitted on any premise regardless of the number of street frontages.

207.6C Each commercial and industrial premise with greater than 400 feet of frontage on any one (1) public street, regardless of the number of commercial or industrial establishments on such premise, shall be allowed two (2) on-premise freestanding business sign structures per public street frontage, but in no case shall more than three (3) freestanding sign structures be permitted on any premise regardless of the number of street frontages.

207.6D The following provisions shall apply for all **on-premise freestanding** signs:

1. For commercial and industrial premises with fifty (50) feet or less frontage on a public street **or located in the CN District** the maximum sign face area of any freestanding sign shall not exceed fifty (50) square feet.
2. For commercial and industrial premises with greater than fifty (50) feet but less than 100 feet of frontage on a public street the maximum sign face area of any freestanding sign shall not exceed 100 square feet in total sign face area.
3. For commercial and industrial premises with 100 feet or greater of frontage on a public street the maximum sign face area of any freestanding sign shall not exceed 250 square feet of total sign face area.
4. In cases where a commercial or industrial premise is allowed two (2) freestanding signs, the aggregate sign face area of both signs shall not exceed 400 square feet. In cases where a commercial or industrial premise is allowed three (3) freestanding signs, the aggregate sign face area of all signs shall not exceed 500 square feet.
5. No on-premise freestanding sign shall be located closer than 100 feet from any other on-premise freestanding sign located on the same premise as measured in a radius from the center of the sign base.
6. No part of any on-premise freestanding sign shall be placed closer than twenty-five (25) feet from any other on-premise located on a different premise or any off-premise freestanding sign as measured from the center of the sign base.
7. No on-premise sign between the height of two (2) feet and eight (8) feet above street level shall be located closer than fifteen (15) feet to the right-of-way of any public street.
8. No on-premise sign with a support structure, pole or pole cover of a width greater than two (2) feet shall be placed closer than fifteen (15) feet to the right-of-way of any public street. No on-premise freestanding sign with multiple support structures, poles, or pole covers with a total width of greater than two (2) feet shall be placed closer than fifteen (15) feet to the right-of-way of any public street. (As amended by Ordinance No. O02-12-32).
9. No on-premise sign shall be located closer than five (5) feet to the right-of-way of any public street.

10. No part of any on-premise freestanding sign located in the CN District shall be higher than twenty (20) feet from street level at a point nearest the sign.
11. No part of any on-premise freestanding sign located in the CL, CR, CBD, PCD, MS, or UNV Districts shall be higher than thirty-five (35) feet from street level at a point nearest the sign.
12. No part of any on-premise freestanding sign located in the CG, CI, LM, or HM Districts shall be higher than fifty (50) feet from street level at a point nearest the sign; except that for any lot or parcel located within 750 feet of the closest right-of-way of Interstate 40 and located in the CG, CI, LM or HM the maximum height shall be 100 feet from street level at a point nearest the on-premise freestanding sign.
13. (As amended by Ordinance No. O02-12-32) The following provisions shall apply for on-premise freestanding **electronic message centers**:
    a. For commercial and industrial premises located in the CL, CG, CR, CBD, PCD, MS, UNV, CI, LM, and HM Districts one (1) electronic message center attached to a permitted on-premise freestanding sign shall be allowed per premise.
    b. Each message displayed on an electronic message center must be static or depicted for a minimum of six (6) seconds. The continuous scrolling of messages is prohibited.
    c. No freestanding electronic message center shall exceed twenty-five (25) percent of the total allowable sign face area for any on-premise freestanding sign; provided, however, when an electronic message center does not exceed thirty-two (32) square feet in sign face area and is attached to an otherwise permitted on-premise freestanding sign, it shall not comprise a portion of the total allowable sign face area for any on-premise freestanding sign.
    d. The addition of any electronic message center to any nonconforming freestanding sign is prohibited.
14. (As amended by Ordinance No. O02-12-32) The following provisions shall apply for on-premise freestanding **changeable copy signs (reader boards)**:
    a. For commercial and industrial premises located in the CL, CG, CR, CBD, PCD, MS, UNV, CI, LM, and HM Districts one (1) changeable copy sign (reader board) attached to a permitted on-premise freestanding sign shall be allowed per permitted freestanding sign.
    b. When a changeable copy sign (reader board) does not exceed thirty-two (32) square feet in sign face area and is attached to an otherwise permitted on-premise freestanding sign, it shall not comprise a portion of the total allowable sign face area for any on-premise freestanding sign.

207.6E (As amended by Ordinance No. O02-12-32) The following provisions shall apply for all **wall** signs:

1. Each commercial or industrial establishment shall be allowed wall signs for on-premise advertising on each outside wall provided that such signs in total shall not exceed fifty (50) percent of the area of the face of the wall upon which the sign is erected, or portion of the wall occupied by the commercial or industrial establishment, whichever is less.
2. Each commercial or industrial establishment shall be allowed one (1) electronic message center or one (1) changeable copy sign (reader board) as a wall sign pro-

vided that such electronic message center or changeable copy sign (reader board) does not exceed twenty-five (25) percent of the area of the face of the wall upon which the sign is erected, or portion of the wall occupied by the commercial or industrial establishment, whichever is less.

3. Each message displayed on an electronic message center must be static or depicted for a minimum of six (6) seconds. The continuous scrolling of messages is prohibited.

207.6F (As amended by Ordinance No. O02-12-32) The following provisions shall apply for **mansard** signs or **roof** signs:

1. Each commercial or industrial establishment shall be allowed one (1) mansard sign or one (1) roof sign per mansard or roof.
2. The sign face area of a mansard sign or roof sign shall not exceed fifty (50) percent of the area of the mansard or roof upon which the sign is erected, or portion of the mansard or roof occupied by the establishment, whichever is less.
3. Where mansard or roof signs are used in combination with wall signs they shall not in total exceed fifty (50) percent of the face of the building.
4. No mansard or roof sign shall extend above the highest portion of the mansard or roof to which it is attached.

207.6G No sign attached to the building shall be allowed to extend above the highest portion of the roof or facade.

207.6H Each commercial or industrial establishment shall be allowed one (1) **projecting** sign provided that such sign shall not exceed twenty (20) square feet in sign face area and shall not extend above any portion of the roof of the building occupied.

207.6I Each commercial or industrial establishment shall be allowed **fascia** signs provided that such signs do not exceed two (2) feet in height and do not extend above the highest portion of the roof.

207.6J **Awning, canopy, marquee and under-awning** signs are permitted for commercial and industrial establishments. Under-awning signs shall not exceed four (4) square feet in sign face area and shall be placed at least seven (7) feet above the sidewalk or ground level so as to not constitute a hazard or impediment to pedestrians.

207.6K For structures located in the CBD District directly abutting the public right-of-way, awning, canopy, or marquee signs overhanging the public right-of-way are allowed provided that no such sign shall be closer than two (2) feet to any street pavement line and provided that no such sign shall obstruct free or clear vision or otherwise cause hazards for vehicular or pedestrian traffic.

207.6L **Mobile or portable** signs are permitted only in the CL, CG, UNV, CI, LM or HM Districts and only under the following terms and conditions:

1. Only one (1) mobile or portable sign shall be allowed per premise.

iii. The relocation does not place the sign within 500 feet of another off- premise sign on the same side of the street.

iv. The owner of the property on which the billboard proposed for relocation is located has agreed, on a form satisfactory to the City of Cookeville, to the termination of rights to replace the billboard at the existing location.

5. Requirements for Billboards and Similar Off-Premise Signs (As amended by Ordinance No. O07-11-31)

A. Off-premise signs shall be located only within the CG, CI, LM, or HM Zoning Districts.

B. No off-premise sign shall be located closer than twenty-five (25) feet from any on-premise sign as measured from the center of the sign base.

C. No off-premise sign located outside a corridor extending a distance of 100 feet from either side of the right-of-way of Interstate 40 or State Highway 111 shall have a display surface area exceeding 300 square feet. No off-premise sign located within a corridor extending a distance of 100 feet from either side of the right-of-way of Interstate 40 or State Highway 111 shall have a display surface area exceeding the requirements of the Tennessee Department of Transportation in effect on September 1, 2007.

D. Only one side of the sign shall be used in determining the display surface area.

E. No off-premise sign located outside a corridor extending a distance of 100 feet from either side of the right-of-way of Interstate 40 or State Highway 111shall exceed fifty (50) feet in height as measured from the uppermost portion of the display surface area to the finished grade at street level and no such sign shall be less than twenty (20) feet in height as measured from the lowest portion of the display surface area to the finished grade at street level. No off-premise sign located within a corridor extending a distance of 100 feet from either side of the right-of-way of Interstate 40 or State Highway 111 shall be at a height exceeding the requirements of the Tennessee Department of Transportation in effect on September 1, 2007.

F. Back-to-back panels of the same shape and dimensions are allowed when the panels are mounted parallel to one another or are placed at an angle between panels not exceeding forty-five (45) degrees. No display surface area shall be allowed between back-to-back panels.

G. No off-premise sign located outside a corridor extending a distance of 100 feet from either side of the right-of-way of Interstate 40 or State Highway 111 shall consist of more than a single panel (multiple panels, stacked or side-by-side panels are prohibited). No off-premise sign located within a corridor extending a distance of 100 feet from either side of the right-of-way of Interstate 40 or State Highway 111 shall have a number of panels exceeding the requirements of the Tennessee Department of Transportation in effect on September 1, 2007.

H. All off-premise signs shall be of **monopole** type construction. No off-premise sign shall be attached to the walls or roofs of any building.

I. No portable signs are allowed for off-premise advertising.

J. No off-premise sign between the height of two (2) feet and eight (8) feet above street level shall be located closer than fifteen (15) feet to the right-of-way of any public street.

K. No off-premise sign shall be located closer than five (5) feet to the right-of-way of any public street.

L. No off-premise sign shall be located along Jackson Street West from its intersection with South Willow Avenue westward to its intersection with West Broad Street (U.S. 70) with the exception of those properties located within the LM, "Light Manufacturing", district located in the vicinity of Jackson Street West and east of C.C. Camp Road as of March 26,1995.

M. No off-premise sign shall be located along Neal Street from its intersection with South Jefferson Avenue eastward to its intersection with East Spring Street.

N. No off-premise sign shall be located along Veterans Drive from its intersection with South Walnut Avenue eastward to its intersection with Neal Street.

O. No off-premise sign shall be located within 500 feet of any other off-premise sign located on the same street as measured in a radius from the center of the sign base; this spacing does not prohibit back to back signs on the same structure.

P. No billboard or similar off-premise sign located in a corridor extending a distance of 100 feet from either side of the right-of-way of Interstate 40 or State Highway 111 shall be located within 1,000 feet of any other off-premise sign on the same side of the street as measured along a line parallel to such street.

Q. No billboard or similar off-premise sign located outside a corridor extending a distance of 100 feet from either side of the right-of-way of Interstate 40 or State Highway 111 shall be located within 1,500 feet of any other off-premise sign on the same side of the street as measured along a line parallel to such street.

R. **Electronic message centers** are permitted within the CG, CI, LM, or HM Districts as a portion of a billboard or similar off-premise sign subject to the following conditions:

   i. No electronic message center located on an off-premise sign shall exceed seventy-five (75) square feet in total sign face area. The total sign face area on any electronic message center shall comprise a portion of the total sign face area of the off-premise sign to which it is attached.

   ii. Each message displayed on an electronic message center must be static or depicted for a minimum of six (6) seconds. The continuous scrolling of messages is prohibited.

   iii. The addition of an electronic message center to any existing billboard or similar off-premise sign located in a district other than CG, CI, LM, and HM is prohibited.

S. **Electronic display screens** are permitted within the CG, CI, LM, or HM Districts as off-premise signs subject to the following conditions:

   i. Each image displayed on an electronic display screen must be static or depicted for a minimum of ten (10) seconds.

ii. Animated images and images which move or give the appearance of movement are prohibited. This restriction shall not prohibit the dissolving or replacing of one image with another image.

iii. The conversion or addition of an electronic display screen to any existing billboard or similar off-premise sign located in a district other than CG, CI, LM, and HM is prohibited.

T. **Multi-prism** billboards and similar off-premise signs area permitted within the CG, CI, LM, or HM Districts. The conversion of any existing billboard or similar off-premise sign located in a district other than CG, CI, LM, and HM is prohibited.

SECTION 207.7 SIGN MAINTENANCE

For all signs and similar advertising structures, including any existing conforming or nonconforming signs, the following regulations shall apply:

207.7A All signs, support structures, braces, guys, anchors, and electrical equipment shall be kept in safe repair and shall be well maintained.

207.7B All signs and support structures shall be maintained in such a manner so as to allow a clear and unobstructed view of traffic when approaching an intersection or exiting or entering private property.

207.7C The area around all signs shall be properly maintained, clear of brush, trees and other obstacles so as to make signs readily visible.

207.7D All burned out bulbs or damaged panels shall be promptly replaced.

207.7E All sign copy shall be maintained securely to the sign face and all missing copy shall be replaced.

207.7F Any sign or similar advertising structure failing to meet the requirements of this Section shall be repaired or removed within thirty (30) days after receipt of notification from the Department of Planning and Codes.

SECTION 207.8 REMOVAL OF ABANDONED, ILLEGAL, NONCONFORMING OR OBSOLETE SIGNS

The following provisions shall apply for the removal of abandoned, illegal nonconforming, or obsolete signs:

207.8A Abandoned or obsolete signs or sign structures, including any nonconforming on-premise or off-premise sign or sign structure, shall be removed within ninety (90) days of written notification by the Department of Planning and Codes.

Glen Ellyn, Village of. 2008. *Village Code*.

Title 4. Building Regulations
Chapter 5. Sign Code

4-5-4: General Standards And Design Criteria:
The construction and structural components of all signs shall be in conformance with the following general provisions:

(E) Illumination: Signs may be illuminated by means of external light sources, a light source contained within the sign and visible through a translucent surface or by neon tubing, with such illumination complying with the following regulations:

1. Brightness Limitation: In no instance shall the lighting intensity of any sign, whether resulting from internal illumination or external illumination, exceed the illumination intensity below:

(a) Thirty (30) foot-candles measured perpendicular to the face of the sign from a distance equal to the narrowest dimension of the sign; or

(b) One foot-candle on the adjoining residential property lot line closest to the sign, measured three feet (3') above the surface of the ground.

2. Constant: Illumination shall be constant in intensity and color and shall not consist of blinking, flashing, animated or scintillating lights. Time and temperature signs are considered changing signs (automatic) and shall not be considered flashing signs;

3. Maximum Exposed Lighting: No exposed reflecting type bulb or incandescent lamp which exceeds fifteen (15) watts shall be used in any sign;

4. Nonglaring: The light from any illuminated sign shall be so shaded, shielded or directed that the light intensity will not cause glare to surrounding areas, including adjacent public rights of way;

5. No Traffic Hazards: Neither the direct nor reflected light from light sources shall create a traffic hazard for, or confuse operators of motor vehicles, or in any way interfere with the driver's view of approaching, merging or intersecting traffic;

6. Projecting Light Fixtures: Gooseneck reflectors or arms projecting from the sign surface mounted with lights for the purpose of illuminating the sign shall be permitted for wall and freestanding signs, except that fixtures shall not project into the public right of way.

4-5-5: Regulation By Type Of Sign:
The following criteria are established for signs classified by structure and function or use. Additional regulations for certain signs appear under zoning district requirements. Permits must be obtained to erect these signs as provided in section 4-5-14 of this chapter.

(D) Changing Sign (Automatic): Also known as an electronically variable message sign (EVM), this sign shall be allowed within the village of Glen Ellyn subject to the following regulations, in addition to all other applicable regulations in this code: (Ord. 3995, 3-8-1993)

1. Sign displaying time, temperature or date is allowed only in commercial districts, except C4 and C5 (C5 may be allowed as a variation), subject to the illumination standards in subsection 4-5-4(E) of this chapter, and the following regulations: (Ord. 4562, 1-26-1998)

(a) Area: The maximum area of such a sign shall not exceed eighteen (18) square feet and such area shall be included in the allowable primary signage for the establishment;

(b) Location: The sign shall be erected only by attachment to the primary sign;

(c) Minimum Interval: The message shall appear in intervals of no less than five (5) seconds;

(d) Movement Restriction: The use of animation, or flashing, scrolling or blinking characters is prohibited; and

(e) Number: One sign per establishment is allowed. (Ord. 3995, 3-8-1993)

2. EVM sign, other than time, temperature and date sign, is allowed only in commercial districts, except C4 and C5 (C5 may be allowed as a variation), subject to the illumination standards in subsection 4-5-4(E) of this chapter, and the following regulations: (Ord. 4562, 1-26-1998)

(a) Brightness Control: The sign shall be equipped with photosensitive equipment which automatically adjusts the brightness and contrast of the sign in direct relation to the ambient outdoor illumination;

(b) Hours Of Operation: The sign may operate only between the hours of six o'clock (6:00) A.M. and ten o'clock (10:00) P.M. in commercial zoning districts where the establishment abuts a residential district;

(c) Minimum Interval: The message displayed on such sign may be changed no more than twice in any twelve (12) hour period;

(d) Movement Restriction: The use of animation, or flashing, scrolling or blinking characters is prohibited; and

(e) Number: One sign per establishment or lot is permitted.

4-5-7: Prohibited Signs:
The following signs are specifically prohibited:

(A)Animated sign; (Ord. 3995, 3-8-1993)

(B)Attention getting device, except for balloon displays as authorized pursuant to subsection 4-5-8(B) of this chapter and banner signs as authorized pursuant to section 4-5-9 of this chapter; (Ord. 5517, 11-13-2006)

(C)Festoon lighting (except in the C5A and C5B zoning districts in accordance with the following):

1. All such lights shall be white in color, except as otherwise allowed in association with permitted holiday decorations.

2. Such festoon lighting shall not blink, flash or otherwise change in illumination intensity.

3. A minimum clearance of seven feet (7') shall be provided between ground level and any festoon lighting.

4. Such festoon lighting shall be maintained and operated in good working order.

5. Such festoon lighting shall not be strung across vehicular access drives, between buildings or in any location where it is the opinion of the fire chief that such lights may interfere with emergency operations.

6. Bare bulbs shall be kept a safe distance away from and shall not come in contact with any combustible material.

7. All festoon lighting shall conform with the applicable provisions of the building code; (Ord. 5591, 7-23-2007)

(D)Flashing sign;

(M)Any sign which by reason of size, location, content, color or type of illumination is determined to be a traffic hazard as defined in subsections 4-5-4(J) and (K) of this chapter;

(Ord. 3995, 3-8-1993)

Kent (Washington), City of. 2008. *City Code*.
Chapter 15.06. Sign Regulations.

15.06.030 Prohibited signs.
The following signs are prohibited in all districts within the municipal boundaries of the city, except as specifically allowed as temporary signs:

E. Signs within seventy-five (75) feet of the public right-of-way which are animated, revolving more than eight (8) revolutions per minute, blinking or flashing, except public service signs such as those which give the time, temperature, and humidity.

15.06.040 General restrictions and limitations for all districts.

R. Off-premises signs.

3. Standards.

a. Maximum size. As of the effective date of the ordinance codified in this subsection, the maximum size per sign face is three hundred (300) square feet.

b. Maximum height. Maximum height is thirty-five (35) feet.

c. Distance from any intersection. Off-premises signs shall be located a distance of three hundred (300) feet from any intersection.

d. Double-faced signs. An off-premises sign structure may contain up to two (2) sign faces arranged either back-to-back or in a V-shape arrangement. The use of tri-vision panels on a sign face shall not in itself constitute additional sign faces.

e. Spacing. Not more than four (4) sign structures per one thousand (1,000) lineal feet are permitted.

4. Permits. Off-premises signs shall not be altered with regard to size, shape, orientation, height, or location without the prior issuance of a building permit. Ordinary maintenance shall not require building permits. Off-premises sign copy replacement may occur at any time and is exempt from the requirement for building permits.

5. Tri-vision panels. Subject to applicable permitting requirements, the allowable faces on off-premises sign structures listed on the official city of Kent off-premises sign inventory may contain tri-vision panels which rotate, subject to KCC 15.06.030(E). Tri-vision panels are the only type of moving parts authorized on off-premises signs.

6. Unpermitted signs. Owners of off-premises signs that have unpermitted tri-vision panels as of the date of the ordinance codified in this subsection shall have one (1) year from the effective date of the ordinance enacting this provision to apply for and obtain permits for such.

Used with permission.

7. Electronic video signs prohibited. Off-premises signs that contain electronic video displays similar to or otherwise depicting a television screen are prohibited.

8. Hazard or nuisance. All off-premises signs, together with all of their supports, braces, guys and anchors, shall be kept in good repair and in a proper state of preservation and safety. If an off-premises sign is determined by the Kent building official to be in a state of disrepair so as to constitute a safety hazard or a nuisance as defined by the building code or Kent City Code, the building official may initiate enforcement proceedings pursuant to KCC 15.10.070.

9. Enforcement. Any violation of the provisions of this subsection (R) shall be subject to enforcement pursuant to KCC 15.10.070.

CHAPTER 1147
SIGNS

1147.01 PURPOSE.

Sign regulations, including provisions controlling the type, design, size and location thereof, are established to promote the public health, safety, and general welfare through the provision of standards for existing and proposed signs of all types by:

(a) Enhancing and protecting the physical appearance of the community;

(b) Promoting and maintaining visually attractive residential, commercial, industrial, and other use districts;

(c) Ensuring that signs are located and designed to reduce sign distraction and confusion that may be contributing factors in traffic congestion and accidents, and maintain safe and orderly pedestrian and vehicular environments;

(d) Providing review procedures that enable the City to evaluate the appropriateness of a sign to the site, building and surroundings; and

(e) Prohibiting all signs not expressly permitted by this Chapter.

1147.02 INTERPRETATION.

(a) In their interpretation and application, the provisions of this Chapter, as most recently amended, shall be held to be the minimum requirements.

(b) The provisions herein shall not amend or in any way interfere with other codes, rules or regulations governing signs within the City. Whenever there is a conflict between any provisions of any adopted ordinance, the more restrictive provisions shall govern.

1147.03 APPLICATION

(a) The regulations contained in this Chapter shall apply to signs outside of the public right-of-way, except when specifically stated otherwise.

(b) A sign may only be erected, established, painted, created or maintained in the City in conformance with the standards, procedures, exemptions, and other requirements of this Chapter.

(c) Architectural features that are either part of the building or part of a

Ord. 195-07
Effective 1-9-08

Used with permission of the City of Medina.

projecting sign and the wall to which it is attached, and lighting fixtures and associated brackets shall not be included in the calculation of sign area.

(7) Street address numerals not exceeding seven inches in height shall not be included in the calculation of sign area. Street address numerals exceeding seven inches in height shall be included in the calculation of sign area.

(b) Determining Sign Height. The height of a sign shall be measured from the average grade at the base of the sign or support structure to the tallest element of the sign structure. Decorative caps, finials, and similar design elements not exceeding 12 inches in height and located on top of supporting posts for a ground sign shall not be included in the calculation of sign height. A ground sign on a man-made base, including a graded earth mound, shall be measured from the lowest point of the base or mound.

(c) Determining Building Frontage and Building Unit for Wall, Awning, and Canopy Signs. For the purposes of this Chapter, the length of the building wall that faces a street or building wall that contains a public entrance to the uses therein shall be considered building frontage.

(1) Building frontage shall be measured along such building wall between the exterior faces of the exterior side walls.

(2) In the case of an irregular wall surface, a single straight line extended along such wall surface shall be used to measure the length.

(3) A building shall have only one building frontage except as otherwise set forth below.

(4) A building shall be considered to have two frontages whenever the lot fronts on two or more streets, or the building has a public entrance on a wall other than the wall that faces the street. The property owner shall determine which wall shall be the primary building frontage and which wall shall be the secondary building frontage. Only one outside wall of any building shall be considered its primary frontage, and only one additional wall shall be considered its secondary frontage.

(5) For multi-occupant buildings, the portion of a building that is owned or leased by a single occupant shall be considered a building unit. The building frontage for a building unit shall be measured from the centerline of the party walls defining the building unit.

1147.07 GENERAL STANDARDS.

(a) Setbacks. All permanent ground signs shall be located not closer than 10 feet to any side lot line and not closer than five feet to any right-of-way.

(b) Illumination.

(1) Temporary signs shall not be illuminated. Permanent signs may be internally or externally illuminated, except where prohibited in this Chapter. The source of illumination shall not be visible, shall be fully shielded, and shall cause no glare hazardous to pedestrians, motorists or adjacent residential uses and districts.

(2) External illumination shall be limited to fixtures that use a maximum 150 watt metal halide, tungsten-halogen or incandescent lamp. Such fixtures shall be directed towards and concentrated on the sign face to prevent glare upon adjacent properties and rights-of-way.

(3) Illumination shall be provided solely by electrical means or devices.

(4) Internal illumination shall be prohibited for awning signs, as well as for all signs in the M-U District and Historic District.

(c) Traffic and Pedestrian Hazards.

(1) No sign shall obstruct traffic sight lines, traffic sign signals at railroad grade crossings or other safety signs.

(2) No sign shall be placed, erected or maintained so as to obstruct, in any manner, any fire escape, window, door, entrance to or exit from any building.

(d) Design Criteria. The following design criteria shall apply to all signs:

(1) Signs in Series. Signs to be seen in series, (such as signs on multi-tenant buildings) shall be designed with continuity and compatibility in terms of style, materials, color, size, and placement on the building facade.

(2) Wall Sign Placement. A wall sign shall be designed to fit within a frame of architectural space specifically intended for signage, and shall not project beyond the ends or top of the building wall to which it is attached.

(3) Ground Sign Compatibility and Landscaping. A ground signs shall be compatible with the design and materials of the building with which the sign is associated. Approved year-round landscaping shall be provided around the base of a ground sign.

(e) Construction. All signs and parts thereof, including cables, guys, braces, supports, etc., shall be securely constructed in conformance with

applicable City building, fire, and electrical codes, and the applicable standards of this Chapter. Wood products should be treated to prevent deterioration. A lightning grounding device shall be provided where required. Letters, figures, and characters shall be securely attached to the sign structure. All signs shall have a surface or facing of materials which are durable for the intended life of the signs. All signs shall be attached by means of metal anchors, bolts or expansion screws, and in no case shall any sign be secured with wire, strips of wood or nails.

(f) Rights-of-Way. No signs shall be erected, placed or overhung in a right-of-way or supported, braced or guyed from or to a public sidewalk, street, alley or public thoroughfare except those signs provided or approved by the City Engineer.

(g) Accessory Use. A sign shall be accessory to the principal use of the lot on which the sign is located, except as otherwise permitted by this Chapter.

(h) Smooth Sign Face. No nails, tacks or wires shall be permitted to protrude from the front of any sign.

(i) Changeable Copy. Changeable copy area, permitted for ground signs only (excluding pole signs), shall not exceed 40 percent of the total sign area of a single sign.

(j) Electronic Message Center Signs. Electronic message center signs, permitted for ground signs only (excluding pole signs), shall be conditionally permitted in all districts, except the M-U, Historic, and TC-OV Districts, where such signs shall be prohibited. An electronic message center sign shall meet the following requirements:

(1) Frequency. Copy change shall not be more frequently than once per 60 seconds.
(2) Color. Copy shall be limited to a single color, as determined by the Planning Commission.
(3) Illumination. An applicant shall provide a photometric plan outlining proposed illumination levels (in footcandles). Illumination levels shall not exceed one footcandle, as measured from adjacent rights-of-way and residential uses and districts.

(k) Outline Lighting of the Building or Roof Line. Outline lighting of the building or roof line shall be conditionally permitted in all districts, except the M-U and Historic Districts, where such signs shall be prohibited. Outline lighting of the building or roof line shall meet the following requirements:

(1) Color. Copy shall be limited to a single color, as determined by the Planning Commission.

(2) Illumination. An applicant shall provide a photometric plan outlining proposed illumination levels (in foot-candles). Illumination levels shall not exceed one foot-candle, as measured from adjacent rights-of-way and residential uses and districts.

1147.08 SIGN IDENTIFICATION, MAINTENANCE AND REPAIR.

All signs, temporary or permanent, including supports, guys, braces and anchors for such signs, regardless of whether or not a Zoning Certificate is required, shall be maintained in a safe, presentable, and good structural condition at all times, including the replacement of defective parts, repainting, cleaning, and other acts required for the maintenance of such sign. The Planning Director may order any sign to be painted or refurbished at least once each year, if needed, to keep the sign in a safe, presentable, and good structural condition.

1147.09 ABANDONED SIGNS.

Abandoned signs shall be deemed to be a public nuisance by reason that continued lack of use results in lack of reasonable and adequate maintenance, thereby causing deterioration and a blighting influence on nearby properties. Whenever a sign is abandoned, the Planning Director shall first document the date of sign abandonment. An abandoned sign shall be considered a violation of this Ordinance only after the Planning Director further documents that both of the following circumstances exist: (1) a period of not less than 180 consecutive days has elapsed since the date of sign abandonment; and (2) no Zoning Certificate has been issued during such period for the building, building unit and/or use associated with the abandoned sign.

1147.10 PROHIBITED SIGNS.

All signs not expressly permitted in this Chapter, or exempt from regulation pursuant to this Chapter, shall be prohibited in the City. Such signs shall include but not be limited to the following:

(a) Abandoned signs.

(b) Billboard signs.

(c) All other off-premises signs, except temporary signs for civic or community affairs of a public or semi-public nature, not for private gain.

(d) Pole signs with a single pole.

(e) Temporary changeable copy signs.

(f) Rooftop signs except those signs that appear to be a continuation of the face of the building or a mansard roof so long as the sign does not extend above the upper edge of the mansard roof line.

(g) Animated signs.

(h) Signs painted on sidewalks.

(i) Signs attached to trees, utility poles, streetlights, and public benches including benches at bus stops.

(j) Mobile signs, except those on licensed commercial delivery and service vehicles. Such vehicles shall not be parked in any district closer to the right-of-way than the front line of the principal building.

(k) Merchandise, equipment, products, vehicles or other items not themselves for sale and placed for attention getting, identification or advertising purposes.

(l) Signs erected or attached to accessory structures and fences.

(m) Internal illumination of all or part of the roof.

(n) Any sign not specifically authorized by this Chapter.

1147.11 VIOLATION.

Any sign erected or altered which does not conform to the provisions of this Chapter shall be considered a violation of this Ordinance and, therefore, subject to the provisions set forth in Sections 1107.04 and 1107.05 of this Ordinance.

1147.12 SIGNS FOR RESIDENTIAL USES IN ALL DISTRICTS AND SIGNS IN RESIDENTIAL, OPEN SPACE-CONSERVATION, AND PUBLIC FACILITIES DISTRICTS.

The following signs shall be permitted for residential uses in all districts, and for all uses in the R-1, R-2, R-3, R-4, O-C, and P-F Districts:

(a) One permanent signplate for each single-family dwelling unit, one permanent signplate for each two-family dwelling unit, one permanent signplate for each public entrance to each multi-family residential building, and one permanent signplate for each public entrance to each nonresidential building.

Oak Ridge (Tennessee), City of. 2006. *Zoning Ordinance*.
Article XIV. Sign Regulations.

Section 14.04. Definitions.

Animated (Moving) Sign: Any sign or permanent structure that uses movement, projection, or change of lighting or other electrical impulses to depict action or create a special effect. Variable display signs, beacons and electronic moving message boards are animated signs under this article.

Changeable Copy Sign (Readerboard): A sign containing letters or numbers that can be changed at will to display different messages. Electronic moving message board signs are not changeable copy signs under this article.

Channel Letters: Letters comprised of a U-shaped aluminum channel, with plastic front faces. Letters can be lighted with neon or Light Emitting Diodes (LED). Neon letters can be left open without faces (open faced neon letters).
(Ord. No. 12-04 Revised Effective 5/14/04)

Flashing Sign: Any sign which contains an intermittent or flashing light source, or which includes the illusion of intermittent or flashing light by means of animation, changes in the degree of light intensity, an externally mounted intermittent light source, or reflective metal strips.

Halo Letters: A type of a ground sign that is non-illuminated, reflective or indirectly illuminated, with the exception of Light Emitting Diodes (LED) lit channel letters or halo lit LED letters, limited to a symbol and/or name identifying the development or site, and a numeric display of the site street address located at the main entrance. Such signs shall only apply to those sites with five (5) or more buildings, five (5) or more lots, or are located in a contiguous campus environment.
(Ord. No. 12-04 Revised Effective 5/14/04)

Illuminated Sign:
1. Direct: A sign whose light source is either located in the interior of the sign so that the rays go through the face of the sign, or which is attached to the face of the sign and is perceived as a design element of the sign.
2. Indirect: Illumination of a sign that is affected by a source of light not contained within the sign itself and is not visible elsewhere on the plot or parcel where said illumination occurs.

Moving Copy Sign: A sign which incorporates an electronically or mechanically generated changeable copy message within the sign frame, but which does not incorporate any mechanical movement of the sign itself or any use of pulsating or undulating copy message.

Used with permission of Kathryn Baldwin, City of Oak Ridge Community Development Director.

Section 14.07. Signs For Residential Districts
1. Types, Size and Location of Signs Allowed:

a. Subdivision or Multifamily Development Entry Sign
(1) One (1) ground entry sign with either two (2) sides or two (2) one-sided signs on each side of the entrance shall be allowed at each principal entrance. Such sign(s) shall be permanent and can be either indirectly illuminated or non-illuminated, with the exception of Light Emitting Diodes (LED) lit channel letters or halo lit LED letters. Each sign face shall not exceed thirty-two (32) square feet of surface display area.

Section 14.10. Signs For Office-Institutional Districts.
1. Types, Size and Location of Signs Allowed:

One (1) ground sign shall be allowed per principal building except as noted in Subsection E below. In addition, one (1) wall or window sign per principal building shall be allowed. The total combined area of all signs shall not exceed two (2) square feet per linear foot of the front face of the principal building. In the event of multi-tenant occupancies, the owner shall determine what portion of each tenant's allowable sign area shall be allotted to the allowable ground sign(s).

a. Ground Signs
(3) Ground signs can either be changeable copy readerboards or moving copy sign, and either shall be an integral part of the ground sign. The moving copy sign shall not exceed one (1) line of moving copy. In no instance shall the combination of the changeable copy readerboard or moving copy sign display area and the ground sign surface display area exceed thirty-two (32) square feet, nor shall the combination exceed the height limitation of eight (8) feet.

f. Development Entry Signs
For developments that include five or more buildings or five or more lots, one (1) ground entry sign with either two (2) sides or two (2) one-sided signs on each side of the entrance shall be allowed at each principal entrance. Such sign(s) shall be permanent and can be either indirectly illuminated or non-illuminated, with the exception of Light Emitting Diodes (LED) lit channel letters or halo lit LED letters. Each sign face shall not exceed thirty-two (32) square feet of surface display area and the top of the sign shall be no higher than eight (8) feet above ground level. (Ord. No. 12-04 Revised Effective 5/14/04)

Section 14.12. Signs For Community Business Districts.

1. Types, Size and Location of Signs Allowed:
a. Pole Signs

(3) Pole signs can be either changeable copy readerboards or moving copy sign, and either shall be an integral part of the pole sign. In no instance shall the combination of the changeable copy readerboards or moving copy sign surface display area and the pole sign surface display area exceed eighty (80) square feet nor shall the combination exceed the height limitation of twenty (20) feet. The changeable copy readerboard must be affixed to and be an integral part of the pole sign.

b. Ground Signs

(3) Ground signs can either be changeable copy readerboards or moving copy sign, and either shall be an integral part of the ground sign. In no instance shall the combination of the changeable copy readerboards or moving copy sign surface display area and the ground sign surface display area exceed one hundred (100) square feet, nor shall the combination exceed the height limitation of eight (8) feet.

Section 14.15. Prohibited Signs.

All signs not expressly permitted under this article or exempt from regulation hereunder in accordance with the aforementioned sections or any other City ordinances are prohibited. Such signs include, but are not limited to:

2. Signs which are not securely affixed to the ground, or otherwise affixed in a permanent manner to an approved supporting structure, including but not limited to portable, moving (animated), flashing, inflatable and revolving signs; provided however, that temporary signs specifically allowed under this article shall be exempt from this prohibition.

3. Flashing signs or signs that contain reflective materials, which present a hazard or danger to traffic or the general public.

Section 14.16. Illumination of Signs. Illuminated signs shall adhere to the following provisions and restrictions in addition to those stated in the sign requirements by zoning districts.

1. Signs may be illuminated by a direct or indirect source of light, as per district regulations, provided the indirect light source is shaded, shielded or directed so that no direct rays or glare emanating from the light source are visible from any public right-of-way or abutting property.

2. No sign shall have blinking, flashing, or fluttering lights or other illuminating device, which has a changing light intensity, brightness or color.

3. Neon signs shall be allowed so long as they conform to all district regulations. Fluorescent tubes, which are typically used as a source of internal illumination, shall be shielded or diffused.

4. No colored lights shall be used at any location in any manner so as to be confused with or construed as traffic control devices.

5. Neither the direct nor reflected light from primary light sources shall create a traffic hazard to operators of motor vehicles on public streets.

Oro Valley (Arizona), Town of. 2005. *Zoning Code.*

Chapter 28. Signs.

Section 28.3 Requirements
B. Illumination

1. Illumination of signs may be accomplished only by the following methods:

    e. LED lighting may be a component of a sign as specifically called out under this Chapter.

2. Prohibited Lighting
The following types of light sources are prohibited as means to illuminate or attract attention to any sign:

    c. Blinking, flashing, rotating and animated light sources.

Section 28.4 Definitions and Sign Types

4. Animation
The movement or optical illusion of movement of any part of a sign structure, design, or pictorial segment, including the movement of any illumination, flashing or varying of light intensity. The automatic changing of all or part of the facing of the sign. The movement of a sign set in motion by the atmosphere.

21. Electronic Message Sign
A sign that permits the movement or frequent changing of messages by means of electronically controlled sign copy.

Section 28.5 Permanent Signs

B. Permitted Signs in a Commercial/Industrial District
The following permanent sign types shall be allowed within a Commercial, Industrial and/or Private Schools District.

2. Changeable Copy Sign

    a. Description: A sign or portion thereof with characters, letters, or illustrations that can be changed or re-arranged without altering the face or surface of the sign. Changeable copy signs are limited to and/or restricted to theater, service station/fuel signs, schools, and religious institutions. Such signs shall be integrated into freestanding and/or wall mounted type signs and may be illuminated. Changeable copy may not be changed electronically, except for those specifically called out under this ordinance.

    b. Quantity: One (1) allowed as part of a freestanding or wall sign.

    c. Area of Sign: To be included as a component of a freestanding or wall sign.

Section 28.9 Prohibited Signs

A. Prohibited Permanent and Temporary Signs
The following permanent and temporary signs shall not be allowed on any property or public right-of-way and shall be deemed prohibited unless otherwise specified within this Chapter.

3. Electronic Message Centers

5. Flashing Lights

9. Moving/Animated Signs

San Luis Obispo (California), City of. 2007. *Municipal Code.*

Chapter 15.40. Sign Regulations.

15.40.300 Prohibited signs.
The following signs are prohibited and subject to immediate abatement by the city of San Luis Obispo's code enforcement officer. The city has a compelling interest to prohibit the following signs to further the intent and purpose (Section 15.40.110) of these sign regulations and to enforce local, state and federal law.

A. Attention Getting Devices. Pennants, streamers, spinners, balloons, inflatable signs, search lights, beacons, flashing lights or messages and other similar attention-getting devices, unless authorized in conjunction with a temporary use permit or special event permit, or architectural review, and provided the city's public works director determines that such a sign will not create a distraction for users of the public right-of-way.

15.40.430 Illumination.
Where illumination of signs is permitted, the following standards shall apply.

A. Lighting for signs shall not create a hazardous glare for pedestrians or vehicles either in a public street or on any private premises.

B. The light source, whether internal to the sign or external, shall be shielded from view. This requirement is not intended to preclude the use of diffused exposed neon.

C. Sign illumination for externally illuminated signs shall utilize focused light fixtures that do not allow light or glare to shine above the horizontal plane of the top of the sign or onto any public right-of-way or adjoining property.

D. Signs shall not be illuminated after ten p.m. or close of business, whichever is later.

E. Each sign shall be designed so that illumination does not exceed one hundred luxes (ten footcandles) measured at a distance of ten feet from the sign.

F. In the office zone illumination of the sign face shall not exceed ten luxes (one footcandle) measured at a distance of ten feet from the sign.

G. Signs located in residential zones may not be illuminated, except directory signs, which shall not exceed ten luxes (one footcandle) measured at a distance of ten feet from the sign.

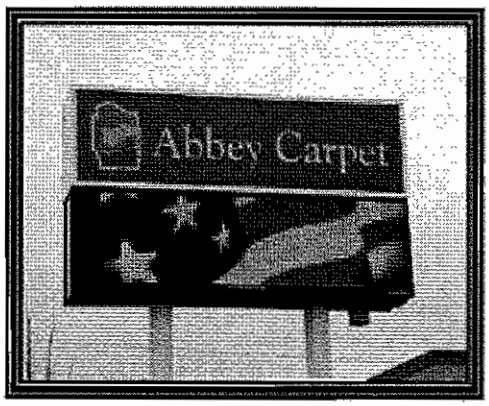
H. These maximum illumination levels are not guaranteed and may need to be reduced to ensure compliance with the standards in subsections A, B and C of this section.

I. Internally illuminated cabinet signs are prohibited in the downtown commercial (CD) zone.

J. All internally illuminated cabinet signs, including monument signs, walls signs, projecting signs and pole signs shall have dark backgrounds with light lettering, subject to compliance with the standards in subsections E, F and G of this section, unless otherwise approved by the ARC. (Ord. 1455 § 2 (part), 2004)

15.40.470 Sign standards by sign type.
This section is intended to be used in conjunction with other standards contained in these sign regulations. In no case may the maximum number or size of signs, or their illumination levels, exceed the standards provided by Section 15.40.460, Sign standards by district, and Section 15.40.430, Illumination, of these regulations, respectively.

K. Electronic Message Centers.



Signage Guidelines

Electronic message centers (EMCs) come in different shapes and sizes and typically have a scrolling message. Some EMCs have interactive computer screens.

1. Location and Number. Electronic message centers may be incorporated into pole signs, mounted or freestanding. One EMC is permitted per premises.

2. Size. The allowable size of an electronic message center is determined as part of architectural review. If part of a pole sign, the electronic message center may only constitute ten percent of the overall sign area. If mounted on a building or if freestanding, the maximum area is eight square feet.

3. Illumination. EMCs may be illuminated, consistent with Section 15.40.430 of these sign regulations.

4. Zoning. EMCs may be located in all commercial zoning districts, subject to architectural review.

15.40.480 Signs requiring architectural review.
The following signs require architectural review prior to issuance of a sign permit. The community development director shall determine if the level of review is

aesthetically insignificant, minor or incidental or whether the ARC must review the sign:

A. Animated Signs. Signs consisting of or containing any moving, rotating, flashing or otherwise animated light or component.

15.40.1000 Definitions.
As used in this chapter, the following terms and phrases shall have the indicated meanings:

"Attention-getting sign" means any sign with moving parts, flashing lights, and/or neon colors, or signs incorporating pennants, streamers, large helium balloons or any similar visual device used for the purpose of drawing attention.

Tyler (Texas), City of. 2008. *Code of Ordinances*.

Chapter 10. Development Standards.
Division H. Sign Regulations.

Sec. 10-403. Prohibited Signs
All signs not expressly permitted under this code or exempt from regulation hereunder in accordance with the previous section are prohibited in the city. Such signs include, but are not limited to:

d. Flashing, fluttering, undulating, swinging, rotating, or otherwise moving signs;

Sec. 10-409. Sign Standards in Nonresidential Districts

Sign Type district/use	***Max. Number***	***Max. Area (sq. ft.)***	***Max. Height (feet)***	***Max. Projection or Min. Setback (ft)***	***Additional Requirements***
PERMANENT SIGNS					
Freestanding Signs				**Setback**	
Electronic message center (EMC), C-1 district	1 per lot	32	8	5	See Sec. 10-415
Electronic message center (EMC), C-2, DBAC, PCD, PMXD-1, PMXD-2, M-1, and M-2 district	1 per lot	64	8	5	See Sec. 10-415

Sec. 10-415. Electronic Message Center Signs

a. In addition to the standards set forth in Table, all electronic message centers (EMC) signs located in the city must adhere to the following requirements:

1. EMCs must meet all the requirements of this sign code. All EMC signs shall comply with the appropriate City sign and other regulations.

2. The maximum height of any freestanding EMC that is not attached to or part of a multi-part freestanding sign is eight feet. Where an EMC is attached to or part of a multi-part freestanding sign, the maximum sign height will be determined according to the maximum permissible height of the sign type of which the EMC is a part.

3. The maximum area of an EMC sign shall not exceed sixty-four (64) square feet, and is in addition to other sign allowances. As an EMC sign is a form of reader board, the EMC sign square footage may not be coupled with any other form of reader board.

Used with permission of the City of Tyler.

4. Minimum separation between EMC signs is 70′, unless approved by the Planning Director based on visibility needs.

5. EMCs may be used for all or part of an on-premise sign that displays a commercial or noncommercial message. EMCs may not display off-premises commercial advertising;

6. All EMC signs shall have a minimum hold of three (3) seconds, with one (1) second per line of copy.

7. No animation of any type, or flashing light, or "spell on" display mode is allowed on any EMC.

8. All EMC signs shall be antiglare. All EMCs must be equipped with an automatic dimmer device.

9. As measured at the property line, the maximum light emanation from an EMC sign shall be no greater than .2 footcandles.

10. EMC signs must not face single family zoned property consisting of the following zoning designations: R-1A, R-1B, R-1C, R-1D, R-2, PXR and PUR or property used for single family regardless of zoning.

11. No EMC signs are allowed within or facing historic districts.

12. Any malfunctioning EMC must be turned off or display a blank screen until repaired.

13. All electrical equipment used to operate or install an EMC must be UL listed.

14. All electrical power to an EMC sign must be supplied via underground carrier, inside approved conduit, and must be installed according to the city electrical requirements.

15. All EMC signs shall be kept in good operating condition and maintained with good external appearance.

b. If any non-conforming existing EMC sign is damaged so that repairs would cost as much as 60 percent of the value of the sign, the sign may be repaired only if it is brought into conformance with this ordinance. (ORD. 0-97-62, 12/10/97) (Ord. No. 0-2007-94; 7/25/07).

(a) Gravity feed shall be used only with burners arranged to prevent abnormal discharge of oil at the burner by automatic means specifically approved for the burner with which it is used.

(b) An approved domestic type oil burner may be supplied by gravity from two (2) connected inside or outside storage tanks, provided neither tank exceeds two hundred seventy-five (275) gallons capacity and they are connected to the fuel line by an approved three (3) way valve.

(5) Pressure Tank Feed. Tanks for systems under pressure shall be designed for six (6) times the maximum working pressure and be tested and proven tight at twice the maximum working pressure. The maximum working pressure shall not exceed fifty (50) pounds per square inch. All such tanks shall be provided with a reliable pressure gauge, an air relief valve and a suitable device to vent the tank in case of fire, both discharging outside of the building.

(6) Oil Gauging. Test wells shall not be installed inside buildings. Gauging devices such as liquid level indicators or signals shall be installed so that oil or vapor will not be discharged into the building from fuel oil systems.

(7) Tank Vents. Storage tanks shall be equipped with an open vent or an approved automatically operated vent arranged to discharge to the open air and shall not be less than one inch in size. Vent pipes shall terminate outside of buildings at a point not less than two (2) feet from any window or door opening and shall be capped with a waterproof hood.

(8) Tank Fill Pipes. Underground tanks and storage tanks inside buildings shall be filled only through fill pipes terminating outside of buildings at a point not less than five (5) feet from any building opening at the same or lower level and shall be closed tight when not in use by a metal cover designed to prevent tampering.

(9) Piping. All piping shall be standard, full weight, wrought iron, steel or brass pipe with standard fittings or approved brass or copper tubing with standard fittings. All piping shall be rigidly secured in place and protected from injury in a workmanlike manner. Horizontal pipes in the basement shall be laid under or within the concrete floor and shall have a covering of not less than one inch.

(10) Approved Fuel Oil Burners. No fuel oil burner shall hereafter be installed in any building in the City which does not bear the approval of recognized authorities.

(11) Dangerous and Defective Oil Heating Equipment. Oil burners or fuel oil equipment which are defective and dangerous to life or property shall be made safe or removed.

(12) Permits. Before proceeding with the construction, erection, alteration, remodeling or replacement of any flammable liquid storage tanks or equipment, a permit shall first be obtained from the Building Inspector. Before a permit is issued, an application shall be filed with the Inspector by the owner or contractor, specifying the location, size, use and capacity of such storage tanks or equipment, together with the estimated cost of the work. If the application shows that all the work will be in compliance with the provisions of this Chapter, the Inspector shall approve the same and issue a permit for which a fee shall be charged in accordance with Section 13.255(9).

13.21 SIGN CODE.[7]

(1) Purpose
(2) Definitions
(3) Requirement of conformity
(4) Conformity of nonconforming signs
(5) Procedures
(6) Permits, inspections and revocations
(7) Sign construction standards
(8) Maintenance
(9) Variance to sign code
(10) Prohibited signs, lighting and movement
(11) Signs in the public right of way
(12) Temporary signs
(13) Master Sign Program

[7] **Ord. 6552, 12/19/2000; Ord. 6560, 2/20/2001; Ord. O-2005-0031, 9/6/2005; Ord. O-2007-0006, 4/17/2007**

Used with permission.

(15) Wall signs
(16) Projecting signs
(17) Awnings
(18) Window signs
(19) Changeable copy signs and electronic message centers
(20) Tenant directory boards
(14) Freestanding signs
(21) Directional signs
(22) Informational signs
(23) Sandwich board signs
(24) Creative signs
(25) Violation, penalties and injunctive action
(26) Severability

(1) Purpose. It is declared that the regulation of signs within the City is necessary and in the public interest to:

(a) Protect property values within the City.

(b) Preserve the beauty and the unique character of the City by aesthetically complementing the development, which a sign identifies.

(c) Promote a healthy and properly designed business environment.

(d) Provide for the expression of both commercial and noncommercial speech.

(e) Provide for the identification and advertising needs of businesses.

(f) Safeguard the general public from damage and injury, which may be caused by the faulty and uncontrolled construction of signs within the City.

(g) Protect against hazards to vehicular traffic movement through improper placement of signs.

(h) Promote the public safety, welfare, convenience and enjoyment of travel and the free flow of traffic within the City.

(i) No regulation of sign content is intended to result from the application of this sign code.

(2) Definitions. As used in this section:

"Abandoned sign" means a sign or portion of a sign structure located on a property which becomes vacant and is unoccupied for a period of sixty (60) days or more, any sign or structure which pertains to a time, event or purpose which no longer applies or a sign which no longer directs attention to a business, activity or service offered or product sold on the premises.

"Area of sign" means that area enclosed by one continuous line, connecting the extreme limits or edges of writing, representation or similar figures or characters together with any material forming an integral part of the display or forming the backing surface or background on which the message or symbols are displayed on a sign. The area shall be determined using the largest sign area or silhouette visible at any one time from any point. This area does not include the main supporting sign structure, but other ornamental attachments are to be included in determining area of sign. As shown below:

"Creative sign" means any sign of unique design that exhibits a high degree of thoughtfulness, imagination, inventiveness and spirit, and that makes a positive visual contribution to the overall image of the City.

"Development sign" means any sign used to identify future residential or nonresidential development or such a development under construction.

"Directional sign" means any sign used to identify a certain location on a premises.

"Electronic message center sign" means a type of changeable copy sign upon which message or display is presented with patterns of lights or other means.

"Fascia" means a flat board, band, or face, used sometimes by itself but usually in combination with moldings, often located at the outer face of the cornice.

"Fixture" means a piece of equipment which has been permanently attached to real estate in such a way as to be part of the premises.

"Flag" means any national flag, flag of political subdivisions and symbolic insignia of any institution or business.

"Flashing sign" means a type of changeable copy sign upon which a message or display is presented more frequently than for three-second intervals.

"Freestanding sign" means any sign which is supported by structures or supports in or upon the ground and independent from any building.

"Grand opening sign" means a sign which calls attention to a new business or the announcement of a change in ownership of a business.

"Height of sign" means the overall height of a sign and/or the supporting structure of a sign, where applicable, measured from the top of the sign and/or supporting structure of the sign to the ground.

"Holders of permit" means, collectively, the owner(s) of the premises on which a sign is located and the lessee(s) of the premises to which such sign pertains.

"Illegal sign" means any sign, except the following:

1. A sign allowed by this section and not requiring a permit.
2. A sign allowed by this section carrying a valid permit.
3. A legal nonconforming sign.

"Informational sign" means a sign that indicates separate buildings or services on premises.

"Maintenance" means the replacing or repairing of a part or portion of a sign made unusable by ordinary wear, tear or damage beyond the control of the owner or the reprinting of existing copy without changing the wording, composition or color of the copy.

"Master sign program" means the establishment of an identification program for any multi-tenant operation within the City, including, but not limited to, office parks, industrial and multi-tenant office and retail buildings, and buildings over twenty-five thousand (25,000) square feet of area. The intent of a master sign program is to give a uniform theme of size, color and style to signs in such a development.

(i) All signs, as designated in the Building Inspections and Zoning Department fee schedule, may be inspected yearly for maintenance and conformance with the code. An annual maintenance inspection fee shall be charged to the sign owner of each sign and is due and shall be paid by March 15 of each year the sign exists. The fee shall be in accordance with the fee schedule.

(9) **Variance to Sign Code.**

(a) Purpose. Sign variances are intended to allow flexibility in sign regulations while fulfilling the purpose of this ordinance. Variance from specific regulations of this section may be granted by the Plan Commission, where, owing to special conditions, a literal enforcement of the provisions of this section will result in practical difficulty or unnecessary hardship; provided, that the spirit of this section shall be observed, public safety and welfare secured and substantial justice done. Nothing in this section, however, is intended to permit the erection or maintenance of signs which create the potential of public harm or for which there is no public benefit or which are in conflict with the City's Master Plan or relevant portions thereof.

(b) Procedure.

1. Any person may request a variance from any provision or requirement of Section 13.21 of the Revised Municipal Code by submitting a written request to the Department of Development not less than 20 days before the next regularly scheduled Plan Commission meeting. A fee shall be required of the applicant at the time that a request for a hearing is made in accordance with Development Review Fees in Chapter 12 of the Revised Municipal Code.

2. The Plan Commission shall review such requests for variances using the following criteria:

a. The sign as proposed will not result in an undue concentration of signage, which renders it difficult or confusing to read existing signs.

b. The proposed sign is unique and of exceptional design or style so as to enhance the area.

c. Site difficulties: unusual site factors preclude the construction of a sign in accordance with this section, which would be visible to the roadway adjacent to the site frontage.

3. Should the Plan Commission find that a variance should be granted, the application will be forwarded to the Building Inspections and Zoning Department with directions to issue a permit in accordance with its decision. If the Plan Commission finds that a variance should not be granted, it shall inform the applicant of the reasons for such decision, in writing within thirty (30) days of the date of such decision. The decision of the Plan Commission shall be the final determination as set forth in sec. 68.12 of the Wisconsin Statutes. The final determination may be appealed pursuant to sec. 68.13 of the Wisconsin Statutes, and the notice of the Plan Commission's decision shall inform the parties of the right and time to appeal.

(10) **Prohibited Signs, Lighting and Movement.**

(a) Lighting. Bare light bulbs shall not be permitted. No flashing, blinking or rotating lights shall be permitted for either permanent or temporary signs. Illumination shall be so installed to avoid any glare or reflection into any adjacent property, or onto a street or alley to create a traffic hazard as determined by the Building Inspections and Zoning Department.

(b) Prohibited Signs. It is unlawful to erect or maintain the following signs:

1. Flashing signs.
2. Portable signs.
3. Pennants or streamers;.
4. Abandoned signs/structures.
5. Snipe signs—signs in, on or over public property; excluding those regulated in Section 13.21(11).
6. Signs that interfere with traffic.
7. All prohibited signs not mentioned in this section.

(11) **Signs in the Public Right-of-Way.**

(a) No sign, pennant, flag or banner shall be erected, placed, located or maintained within the limits of any street or highway unless allowed as hereafter stated. Street or highway limits include all the dedicated rights-of-way, encompassing the traveled portion of the highway, shoulders, sidewalks, ditches and adjacent dedicated areas. This prohibition applies to freestanding signs and those placed on trees, utility poles, fence post stakes and all other structures within the highway limits.

1. Failure to comply with the provisions of this section shall be a violation of sec. 86.19, Wisconsin Statutes, which is hereby adopted, as well as this section.

2. Any sign in violation of this section shall be removed without notice by the Building Inspections and Zoning Department, the Police Department, or the Public Works Department.

3. This prohibition shall not apply to signs placed within the limits of streets or highways by duly constituted municipal, county or state authorities for the guidance or warning of traffic, as provided in sec. 86.19(1) and (4), Wisconsin Statutes, or to mail boxes and paper boxes, bus shelters, or to banners, signs, pennants, flags or other related decorations hung over streets attached to public property as authorized by the Board of Public Works, in which case these will not require a permit under this section.

4. No sign shall be erected, placed, located or maintained at or near the intersection of any streets so as to obstruct free and clear vision or at any location where, by reason of position, shape and color, it may interfere with, obstruct the view of, or be confused with any authorized traffic sign, signal or device, or which makes use of the words "stop," "look," "danger" or other word, phrase, symbol or character in such manner as to interfere with, mislead or confuse traffic.

(b) Signs on Public Property. No person shall erect, place or locate any sign in or on public property, with the exception of projecting signs, which are only allowed in the public right-of-way with a grant of privilege from the Board of Public Works.

(12) **Temporary Signs.**

(a) Permit, Maintenance and Removal.

1. The Building Inspections and Zoning Department may issue a temporary sign permit as stated in this subsection. After permit application, a temporary sign permit may be issued for a time period specified unless as otherwise noted in this subsection.

2. Any temporary sign erected without a permit or for which the permit has expired may be removed by the Building Inspector with or without notice.

3. All temporary signs shall be maintained in good condition and removed promptly upon expiration of the permit or as ordered by the Building Inspector.

(b) Banners.

(a) In no instance may window signs (see Figure 3 below) cover more than twenty percent (20%) of the window space. All window signs must be affixed to the interior of the window.

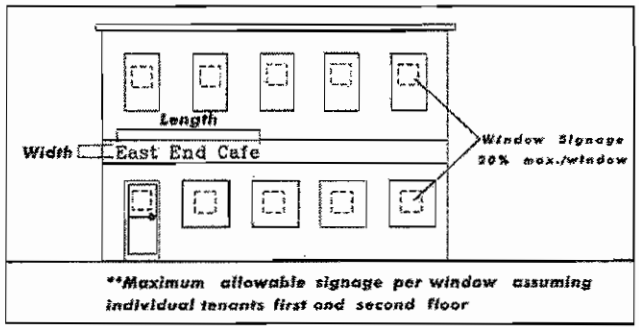


Figure 3: Maximum Window Signage

(19) **Changeable Copy Signs and Electronic Message Centers.**

(a) Area. The computation of sign area for changeable copy signs and electronic message centers shall be included in the total permitted sign area allowed for the building or development where changeable copy signs and electronic message centers are permitted by this section and/or by the Department of Development.

1. The changeable copy portion of the sign must occupy a secondary position to the name of tenant. The area of changeable copy and electronic message centers shall not exceed thirty-five percent (35%) of the sign face, excepting gas stations for the purpose of displaying price.

(b) Number. There shall be only one (1) changeable copy sign or electronic message center on each lot or parcel of land.

(c) Design. Changeable copy signs and electronic message centers must be integrated into the freestanding sign or projecting sign for such building or development.

1. Electronic message centers may not change a message or display by an electronic process more frequently than three-second intervals.

2. The sign may be double-faced.

3. Each sign shall be permanently installed or located.

4. Each sign shall be placed in such a manner so as to not interfere with, confuse or present any hazard to traffic.

(20) Tenant Directory Boards. Exterior tenant directory boards for the purpose of guiding pedestrians to individual businesses within a multi-tenant commercial building or center are allowed, subject to the provisions hereof. Letters on a tenant directory board, identifying occupants, may not exceed three (3) inches in height. Reorganization of a tenant directory board may be done for purposes of appearance or clarity. Changes in the structure, style or design of a tenant directory board or to add or delete the name of an occupant shall be allowed unless such tenant directory board is a legal nonconforming sign, in which case such tenant directory board must first be brought into compliance with all of the provisions of this section. Tenant directory boards shall match the color and style of the principal signage for the property and shall be located either within or outside in proximity to the main entrance area of the building. Tenant directory boards are allowed in addition to wall and freestanding signs, for a Master Sign Program. Tenant directory boards require a permit to be issued by the Building Inspections and Zoning Department.

(21) **Directional Signs.**

5. Signs must not interfere with the vision clearance at corners and must be placed at least fifteen (15) feet from the corner (measured from street curb).

6. Signs shall not be placed more than ten (10) feet from the business entrance in which the sign advertises, at ground level.

7. Signs shall not be placed in the walking or wheelchair pathway areas or private sidewalk pathways.

8. The City of West Allis Building Inspections and Zoning Department shall review sandwich board sign placements and shall not issue a permit for any location that may create a traffic or pedestrian hazard.

(e) Location—Private Property. Sign placement conditions are as follows:

1. Signs shall not be located within ten (10) feet of a fire hydrant or a building fire department connection.

2. Signs shall not be placed to impede or obstruct the general public or the exit of building occupants.

3. Signs must not interfere with the vision clearance at corners and must be placed at least fifteen (15) feet from the corner (measured from street curb).

4. Signs shall not be placed more than ten (10) feet from the business entrance in which the sign advertises, at ground level.

5. Signs shall not be placed in the walking or wheelchair pathway areas or private sidewalk pathways.

6. The City of West Allis Building Inspections and Zoning Department shall review sandwich board sign placements and shall not issue a permit for any location that may create a traffic or pedestrian hazard.

(f) Any business that fails to comply with the provisions of this Code, after receiving one (1) written notification from the City of West Allis will lose its privilege to display a sandwich board sign for a one-year period.

(24) **Creative Signs.**

(a) Purpose. The purpose of the creative sign subsection is to establish standards and procedures for the design, review and approval of creative signs, such that consideration may be obtained from the Plan Commission to:

1. Encourage signs of unique design, and that exhibit a high degree of thoughtfulness, imagination, inventiveness and spirit, and

2. Provide a process for the application of sign regulations in ways that will allow for creatively designed signs that make a positive visual contribution to the overall image of the City, and in certain instances, a creatively designed sign may be permitted even though it is larger or unusual in design.

(b) Applicability. An applicant may request approval of a sign permit under Section 13.21(6) to authorize on-site signs that employ standards that differ from the other provisions of this section but comply with the provisions of this subsection.

(c) Design criteria. An application for a creative sign must first be filed with the Department of Development. The Plan Commission shall review all creative sign applications and proposals. The Plan Commission may approve, deny or request changes to a sign, based on design criteria of that sign. In approving an application for a creative sign, the Plan Commission shall ensure that a proposed sign meets the following design criteria:

1. Design quality. The sign shall:

a. Constitute a substantial aesthetic improvement to the site and shall have a positive visual impact on the surrounding area.

b. Be of unique design, and exhibit a high degree of thoughtfulness, imagination, inventiveness, and spirit.

c. Provide strong graphic character through the imaginative use of graphics, color, texture, quality materials, scale, and proportion.

2. Contextual criteria. The sign shall contain at least one (1) of the following elements:

a. Classic historic design style;

b. Creative image reflecting current or historic character of the City;

c. Symbols or imagery relating to the entertainment or design industry; or

d. Inventive representation of the use, name or logo of the structure or business.

3. Architectural criteria. The sign shall:

a. Utilize and/or enhance the architectural elements of the building.

b. Be placed in a logical location in relation to the overall composition of the building's facade and not cover any key architectural features/details of the facade.

(25) **Violations, Penalties and Injunctive Action.**

(a) Violations. It shall be unlawful and a violation for any person, firm, or corporation to violate the order of the Building Inspector or erect, install, construct, enlarge, alter, display, repair, move, convert or maintain any sign, sign structure or sign device on any building or structure or property in the City contrary to or in violation of any provision of this section, or to cause, permit or support the same to be done.

(b) Penalties. Any person, firm or corporation that shall violate any of the provisions of this section shall forfeit not less than twenty-five dollars ($25.) nor more than five hundred dollars ($500.) for each violation, together with the costs of prosecution, and in default of payment of such forfeiture and costs shall be confined in the Milwaukee County House of Correction until such forfeiture and costs are paid, but not in excess of the number of days set forth in sec. 800.094(4) of the Wisconsin Statutes. Each and every day during which any such violation continues shall constitute a separate violation.

(c) Injunctive Action. In addition to the penalties provided in this subsection, appropriate legal or equitable action may be commenced to enjoin any person, firm or corporation from violating any of the provisions of this section.

(26) **Severability.** If any provision, clause, sentence, paragraph, subsection of part of this code, or application thereof to any person, firm, corporation of circumstance shall, for any reason, be adjudged by a court of

competent jurisdiction to be unconstitutional or invalid, such portion shall be deemed a separate, distinct and independent provision, and such holding shall not affect the validity of the remaining portions thereof. It is the intent of the Common Council that this code would have been adopted had any such invalid provision or provisions not been included.

13.215 CENTRAL BUSINESS DISTRICT (DOWNTOWN) SIGN CODE.[8]

(1) Purpose
(2) Definitions
(3) Requirement of conformity
(4) Conformity of nonconforming signs
(5) Procedures
(6) Permits, inspections and revocations
(7) Sign construction standards
(8) Maintenance
(9) Variance to sign code
(10) Prohibited signs, lighting and movement
(11) Signs in the public right of way
(12) Temporary signs
(13) Awnings
(14) Projecting signs
(15) Wall signs
(16) Window signs
(17) Sandwich board signs
(18) Illuminated signs
(19) Changeable copy signs and electronic message centers
(20) Tenant directory boards
(21) Directional signs
(22) Creative signs
(23) Violation, penalties and injunctive action
(24) Severability

(1) **Purpose.** It is declared that the regulation of signs within the Central Business District (Downtown) is necessary and in the public interest to:

(a) Preserve the unique and historic character of the Downtown and protect property values within the City.

(b) Reduce visual clutter, establish and promote a clean and attractive environment and stimulate economic growth and stability.

(c) Promote a healthy and properly designed business environment by aesthetically complementing the development, which a sign identifies.

(d) Provide for the expression of both commercial and noncommercial speech.

(e) Provide for the identification and advertising needs of businesses.

(f) Safeguard the general public from damage and injury, which may be caused by the faulty and uncontrolled construction of signs within the City.

(g) Protect against hazards to vehicular traffic movement through improper placement of signs.

---

[8] **Ord. 6552, 12/19/2000; Ord. O-2007-0007, 4/17/2007**

3. Signs must not interfere with the vision clearance at corners and must be placed at least fifteen (15) feet from the corner (measured from street curb).

4. Signs shall not be placed more than ten (10) feet from the business entrance in which the sign advertises, at ground level.

5. The City of West Allis Building Inspections and Zoning Department shall review sandwich board sign placements and shall not issue a permit for any location that may create a traffic or pedestrian hazard.

(f) Any business that fails to comply with the provisions of this Code, after receiving one (1) written notification from the City of West Allis will lose its privilege to display a sandwich board sign for a one-year period.

(g) Indemnification. The West Allis Business Improvement District shall indemnify and hold the City of West Allis harmless from and against any and all liability, loss, cost, damage or expense including reasonable attorney fees arising out of, or incurred in connection with each sign and/or damage to any buildings, properties, vehicles or persons injured from any action or inaction by the Downtown Business Improvement District.

(h) Fee. A permit is required for each sign term.

(18) **Illuminated Signs.** Illuminated signs are permitted subject to the following regulations:

(a) Internal Illumination. Signage background, copy and logos may be translucent.

(b) External Illumination. Signs may be indirectly lit by separate clearly articulated architectural lamps mounted to the exterior of the building, above and/or below the sign.

(c) Neon. The use of neon is permitted, provided the signage display and use of color is designed to complement the architectural character of the building to which the sign is affixed.

(d) Glare. All sign lighting shall be designed, located, shielded or hooded so as to prevent the casting of glare or direct light upon adjacent streets or properties.

(e) Prohibitions. Flashing light is prohibited. "Flashing sign" means a type of changeable copy sign upon which a message or display is presented more frequently than for three-second intervals. Intervals greater than three (3) seconds shall not be considered flashing.

(19) **Changeable Copy Signs and Electronic Message Centers.** Changeable copy and EMC signs are permitted subject to the following regulations:

(a) Area. The computation of sign area for changeable copy signs and electronic message centers shall be included in the total permitted sign area allowed for the building or development where changeable copy signs and electronic message centers are permitted by this section and/or by the Department of Development.

1. The changeable copy portion of the sign must occupy a secondary position to the name of tenant. The area of changeable copy and electronic message centers shall not exceed twenty-five percent (25%) of the sign face.

(b) Number. There shall be only one (1) changeable copy sign or electronic message center on each lot or parcel of land.

(c) Design. Changeable copy signs and electronic message centers must be integrated into wall sign or projecting sign for such building or development.

West Hollywood (California), City of. 2008. *Zoning Ordinance*.
Chapter 19.34 Sign Standards
19.34.060 Creative Signs.

A. *Purpose.* This section establishes standards and procedures for the design, review, and approval of creative signs. The purposes of this creative sign program are to:

1. Encourage signs of unique design, and that exhibit a high degree of thoughtfulness, imagination, inventiveness, and spirit; and

2. Provide a process for the application of sign regulations in ways that will allow creatively designed signs that make a positive visual contribution to the overall image of the city, while mitigating the impacts of large or unusually designed signs.

B. *Applicability.* An applicant may request approval of a sign permit for a creative sign to authorize on-site signs that employ standards that differ from the other provisions of this chapter but comply with the provisions of this section.

C. *Application Requirements.* A sign permit application for a creative sign shall include all information and materials required by the department, and the filing fee set by the city's Fee Resolution.

D. *Procedure.* A sign permit application for a creative sign shall be subject to review and approval by the Director when the proposed sign is fifty square feet or less, and by the Commission when the sign is larger than fifty square feet. Notification for a sign permit for a creative sign shall be given in the same manner specified by this Zoning Ordinance for Director-approved development permits in Chapter 19.48.

E. *Design Criteria.* In approving an application for a creative sign, the review authority shall ensure that a proposed sign meets the following design criteria:

1. Design Quality. The sign shall:

a. Constitute a substantial aesthetic improvement to the site and shall have a positive visual impact on the surrounding area;

b. Be of unique design, and exhibit a high degree of thoughtfulness, imagination, inventiveness, and spirit; and

c. Provide strong graphic character through the imaginative use of graphics, color, texture, quality materials, scale, and proportion.

2. Contextual Criteria. The sign shall contain at least one of the following elements:

a. Classic historic design style;

b. Creative image reflecting current or historic character of the city;

c. Symbols or imagery relating to the entertainment or design industry; or

d. Inventive representation of the use, name, or logo of the structure or business.

3. Architectural Criteria. The sign shall:

a. Utilize or enhance the architectural elements of the building; and

b. Be placed in a logical location in relation to the overall composition of the building's façade and not cover any key architectural features and details of the façade.

4. Neighborhood Impacts. The sign shall be located and designed not to cause light and glare impacts on neighboring residential uses.
(Ord. 01-594 § 2 (Exh. A (part)), 2001)

19.34.080 Off-Site Signs.

A. *Purpose.* This section provides standards for off-site signs, including standard and creative billboards, district identification signs, large screen video signs, and tall wall signs.

B. *Applicability.* With the exception of large screen video signs allowed in the CR zone in compliance with subsection (H), below, off-site signs may be allowed in compliance with this section only within the SSP (Sunset Specific Plan) zoning district in compliance with the Sunset Specific Plan, and within the Eastside Redevelopment Project Area in compliance with subsection (J), below. (For other districts, see Section 19.34.090 - Prohibited and Restricted Signs.)

C. *Permit Requirement.* A sign permit issued in compliance with Section 19.34.100 (Sign Permits) shall be required for any off-site signs allowed under the provisions of this section, except where a different permit requirement is established by this section for a specific type of sign.

D. *Approval Authority.* The Commission shall have the authority to approve district identification signs, large-screen video signs, conditional use permits for tall wall signs, creative billboards requested for periods longer than six months, second sides for existing billboards, and new billboards integrated into new construction. The Director may approve all other off-site signs.

E. *Billboards - Creative.* A creative billboard may be approved as a temporary modification to an existing billboard, in compliance with this section. The following regulations are intended to encourage creatively designed billboards that make a positive visual contribution to Sunset Boulevard and to the overall image of the city.

1. Limitation on Location. Creative billboards may be approved only within the SSP (Sunset Specific Plan) zoning district and only in conjunction with an existing billboard.

2. Approval Authority. A creative billboard is subject to approval by the Director or the Commission based on the proposed length of display of the creative billboard per subsection (3), below. A Director-approved creative

billboard shall not be subsequently considered for approval or extension by the Commission.

3. Time Limit.

a. The Director may approve the placement of a creative billboard for a maximum period of six months. No extensions of the approved time limit are permitted and the creative billboard shall be removed immediately upon expiration.

b. The Commission may approve the placement of a creative billboard for a maximum of two years, and may grant extensions of time to the two-year limit at its discretion, provided that the sign continues to meet the intentions and requirements of this section.

4. Standards. A creative billboard shall be designed and located in compliance with all of the following standards.

a. The creative billboard shall alter an existing billboard without changing its location, or exceeding the height limitations identified in the Sunset Specific Plan. Any enlargement of the billboard shall be designed as an integral part of the billboard and contribute to the overall creativity of its design.

b. The creative billboard shall be properly sited and well integrated within the context of its surroundings.

c. The creative billboard shall not have more impact on public or private views than the building envelope allowed by the Sunset Specific Plan.

d. The creative billboard shall exhibit one of the following elements:

(1) Architectural: The proposed creative billboard is compatible with the architectural elements of the structures or site; or

(2) Media: The proposed creative billboard incorporates neon, unique lighting techniques, electronic graphics, moving or animated mechanical elements, three-dimensional elements, City of West Hollywood logo, or other creative concepts deemed appropriate by the review authority. Use of LCD or LED technology as part of a creative sign may only be approved by the Planning Commission.

e. Moving or changing visuals shall be timed to not cause confusion or interfere with the flow of traffic, or otherwise adversely impact public health, safety, or welfare. Moving or changing visuals shall be designed to minimize the impact on neighboring residential uses.

f. The creative billboard shall not result in removal or substantial alteration of trees or landscaping in nearby public parks or in the public right-of-way. Any trimming deemed by the city to be reasonable

to accommodate a sign shall be undertaken only by the city's Landscape and Maintenance Division.

g. Lighting of the creative billboard shall be designed to minimize glare onto other properties and uses.

5. Public Notice. Prior to the consideration for approval of a creative billboard by the Commission, public notice shall be provided in the form of a quarter-page advertisement in a local newspaper and a mailing to all owners and occupants of parcels within 500 feet of the site where the billboard is proposed. All notification shall be at least ten days before the Commission hearing.

6. Revocation. Any Creative Billboard approved by the Commission may be subject to revocation or modification in compliance with Section 19.80.060 (Revocation and Modifications).

H. *Large screen Video Signs.*

1. Criteria for Eligibility. Large screen video signs shall be allowed only in conjunction with new construction of 5,000 square feet or more. Large screen video signs may be approved along Sunset Boulevard on parcels within Geographic Areas Three, Four, Six, or Seven in the Sunset Specific Plan or when the signs are located in the CR zone and meet all of the following criteria:

a. The site where the sign is located is designated gateway node under the General Plan.

b. The site where the sign is located is designated a light way or glow way under the Santa Monica Boulevard Master Plan.

c. The large screen video sign is a component of a special lighting concept contributing the project's gateway status as a glow way or light way as required by the Santa Monica Boulevard Master Plan.

2. Procedure. Public notice shall be provided as required by Chapter 19.48 for a Development Permit.

3. Standards. Proposed video signs shall comply with the following standards:

a. The sign shall be at least 100 square feet in screen area.

b. In the Sunset Specific Plan area, no more than four large screen videos shall be allowed.

c. If the sign is located in the CR zone, the sign shall be at least 200 feet away from any residentially zoned property and 1000 feet away from any other large screen video in West Hollywood.

d. If the sign is located in the CR zone, the sign shall be no larger than 500 square feet in size.

e. Off-site advertising shall be limited to the large-screen video portion of the sign.

4. Time Limits and Extensions. Large screen video signs shall be installed within two years from the date of approval. The Director may, upon request before the expiration date, extend the permit one time for an additional six months in compliance with Chapter 19.62 (Permit Implementation, Time Limits, and Extensions).

5. Art Requirement. Large screen video signs approved within the Sunset Specific Plan must have arts programming to satisfy the applicant's urban art obligation. Each of these video signs shall provide a minimum of thirteen minutes of arts programming per hour, as approved by the Fine Arts Commission. Four minutes of public service announcements may be substituted for four minutes of arts programming. The arts programming on the sign shall be provided on an on-going basis for the life of the project.

19.34.090 Prohibited and Restricted Signs.

B. *Restricted Signs.* The following signs are generally inconsistent with the purposes and standards of this chapter but may be allowed under certain circumstances or through sign approval programs that offer incentives to encourage well designed, creative signs (e.g., comprehensive sign program, creative sign, creative billboard, etc).

1. Animated, moving, flashing, blinking, reflecting, revolving, or other similar signs or signs that incorporate these elements are prohibited unless approved as a creative sign;

5. Electronic graphic signs, are prohibited except:

a. Time or temperature signs;

b. Large screen video displays in compliance with Section 19.34.070(H);

c. A creative sign in compliance with Section 19.34.060; or

d. A sign that is five square feet or smaller in compliance with Section 19.34.100.

19.34.100 Sign Permits.

Sign permits shall be prepared, filed, processed, and approved or denied in compliance with this section.

A. *Application Processing and Fee.* A sign permit application shall include the information and materials required by the department, and the filing fee set by the City's Fee Resolution.

B. *Review Authority.* The Commission shall have the authority to approve district identification signs, creative signs as specified by Section 19.34.060 (Creative Signs), large screen video signs, and the addition of a second billboard face on an existing single-sided billboard on Sunset Boulevard and identified in the billboard inventory. The addition of a second billboard face shall require approval by the Planning Commission at a public hearing. The Director may approve all other types of signs. Appeals of decisions of the Commission or Director shall be processed in compliance with Chapter 19.76 (Appeals).

C. *Criteria for Approval.* The Director or Commission may approve a sign permit if the proposed sign:

1. Meets the requirements of this chapter;

2. Is in compliance with the *Sign Design Guidelines;*

3. Would not interfere with pedestrian or vehicular safety;

4. Would not detract from the character of a historic or architecturally significant structure;

5. Would not be located so as to have a negative impact on adjacent property;

6. Would not detract from the pedestrian quality of street or area; and

7. Would not add to an over-proliferation of signs on a particular property.

D. *Modification of Standards.* Modifications to the requirements of this chapter may be requested in compliance with Chapter 19.60 (Variances and Modifications).

E. *Revocation or Modification of Sign Permits.* The Director may revoke or modify a sign permit, in compliance with Section 19.80.060 (Revocations and Modifications) if it is found that the signs has been erected, altered, reconstructed, or is being maintained in a manner that is inconsistent with the approved permit.
(Ord. 01-594 § 2 (Exh. A (part)), 2001)

Municipalities – Population Under 25,000

SECTION 25
SIGN REGULATIONS

A. PURPOSES

The purposes of these sign regulations are:

1. to encourage the effective use of signs as a means of communication in the city, by providing that

    a. businesses and services may identify themselves,
    b. customers and other persons may locate a business or service,
    c. no person or group is arbitrarily denied the use of sight lines from the public right-of-way for communication purposes, and
    d. persons exposed to signs are not so overwhelmed by the number of messages presented that they cannot find the information they seek, and are able to observe or ignore messages according to the observer's purpose.

2. to maintain and enhance the aesthetic environment and the city's ability to attract sources of economic development and growth, by providing that signs:

    a. do not interfere with scenic views,
    b. do not create a nuisance to persons using public rights-of-way,
    c. do not constitute a nuisance to occupancy of adjacent and contiguous property by their brightness, size, height, or movement,
    d. are not detrimental to land or property values, and
    e. contribute to the special character of particular places or districts within the city, helping the observer to understand the city and orient within it.

3. to promote safety, by providing that signs:

    a. do not create a hazard due to collapse, fire, collision, decay or abandonment,
    b. do not obstruct fire fighting or police surveillance, and
    c. do not create traffic hazards by confusing or distracting motorists, or by impairing the driver's ability to see pedestrians, obstacles, or other vehicles, or to read traffic signs.

4. to minimize the possible adverse effect of signs on nearby public and private property, and

5. to enable the fair and consistent enforcement of these sign restrictions.

These sign regulations are adopted under the zoning authority of the city in furtherance of the more general purposes set forth in Section 2 of Ordinance 808.

The effect of this ordinance as more specifically set forth herein, is:

1. To establish a permit system to allow a variety of types of signs in commercial and industrial zones, and a limited variety of signs in other zones, subject to the standards and the permit procedures of this ordinance.

2. To allow certain signs that are small, unobtrusive, and incidental to the principal use of the respective lots on which they are located, subject to the substantive requirements of this ordinance, but without a requirement for permits,

3. To prohibit all signs not expressly permitted by this ordinance, and

Used with permission of the City of Benbrook.

5. No sign shall be erected, relocated or maintained in a location that obstructs or hinders free ingress to or egress from any door, window or fire escape.

6. Signs that contain exposed bulbs and/or exposed neon shall be prohibited.

7. Signs that contain reflective materials shall be prohibited.

8. Signs that are made structurally sound by guy wires or unsightly bracing shall be prohibited.

D. SIGNS ALLOWED ON PRIVATE PROPERTY

Signs shall be allowed on private property in the City in accordance with, and only in accordance with, Table 25-1. If the letter "P" appears for a sign type in a column, such sign is allowed without prior permit approval in the zoning district represented by the column. If the letter "S" appears for a sign type in a column, such sign is allowed only with prior permit approval in the zoning districts represented by that column. Special conditions may apply in some cases. If the letter "N" appears for a sign type in a column, such a sign is not allowed in the zoning districts represented by that column under any circumstances.

Although permitted under the previous paragraph, a sign designated by an "S" or "P" in Table 25-1 shall be allowed only if the size, location, and number of signs on the lot conform to the requirements of Tables 25-2, which establish permitted sign dimensions by sign type, and with any additional limitations listed in Table 25-1.

The following regulations shall apply to the content of signs:

1. Non-text graphics shall be limited to no more than fifty percent (50 %) of the total sign area.

2. Areas designed to hold changeable copy shall be limited to no more than fifty percent (50%) of the total sign area.

3. Changing signs, whether animated, moving, digital, automatic, flashing or video that changes more frequently than eight times per day shall be prohibited, except those displaying time and temperature information only.

The following regulations apply to development signs:

1. Off-premise signs after acceptance of improvements – Two signs, not to exceed sixteen square feet (16 SF) or six feet (6') in height each, may be allowed for a period up to 12 months beginning on the date of acceptance of site improvements by the City. The signs must conform to all restrictions for the zoning district in which they are located.

2. On-premise signs prior to acceptance of improvements – One sign, maximum area twelve square feet, maximum height 6 feet, will be allowed from ground breaking until the acceptance of improvements by the City, but not longer than 12 months.

3. On premise signs, after acceptance of improvements – One sign, maximum area 64 square feet, maximum height 6 feet, for a 12 month period beginning on the date of acceptance of improvements by the City.

4. For purposes of timing, each phase shall be considered a separate development. The number of signs shall not be increased with each phase.

5. Traffic control signs on private property, such as stop, yield, and similar signs, the face of which meet standards of the Texas Manual on Uniform Traffic Control Devices and which contain no commercial message of any sort.

6. Temporary political campaign signs on private property beyond the one sign allowed by right, so long as the sign meets the size, height, and setback requirements established for freestanding signs within the zoning district and only for a period not more than thirty (30) days prior nor more than ten (10) days following an official election. Political signs placed within rights-of-way or upon public property may be removed and disposed of by City personnel.

7. Vehicle signs, when such vehicle is used in the normal day-to-day operations of the business (i.e. is used or moved at least once during a 72-hour period.)

8. Informational and/or welcome signs erected by the Benbrook Economic Development Corporation on private or public property with owner's authorization, but not on street right-of-way. Such signs may not exceed 120 square feet in area or ten feet (10') in height, unless otherwise approved by the City Council. Such signs may include information on commercial and nonprofit organizations within the City, provided that the area provided for each organization does not exceed four square feet (4 sq.ft.) and that the total area provided for commercial and/or nonprofit organizations does not exceed 51 percent of the total sign area.

9. Bench signs on benches placed by the official transit agency for the City.

H. SIGNS PROHIBITED UNDER THIS ORDINANCE

All signs not expressly permitted under this ordinance or exempt from regulation hereunder in accordance with the previous section are prohibited in the city. Such signs include, but are not limited to:

1. Signs which imitate or resemble any official traffic sign, signal or device; or which use a revolving beam or beacon resembling any emergency vehicle, or are located or illuminated in such a manner as to obscure or otherwise interfere with the effectiveness of an official traffic sign, signal or device, or so as to obstruct or interfere with the view of a driver of approaching, emerging, or intersecting traffic, or so as to prevent any traveler on any street from obtaining a clear view of approaching vehicles for a distance of 250 feet along the street.

2. Signs which are erected or maintained upon trees or which are painted or drawn upon rocks or other natural features.

3. Beacons

4. Strings of lights not permanently mounted to a rigid background, except those holiday lights and decorations exempt under paragraph G.4. above.

5. Projecting signs

6. Roof Signs

7. Signs advertising off-premises businesses, products or services. Signs advertising garage sales that otherwise comply with this Ordinance are exempt from this prohibition.

8. Animated or moving signs

9. Signs located on private property without the consent of the owner of said premises.

10. Signs that are located in or interfere with the use of a required off-street parking space or maneuvering area.

11. Signs which are, or are becoming deteriorated, dilapidated or in danger or falling or otherwise unsafe.

12. Any unauthorized sign on or attached to a public street light, utility pole, hydrant, bridge, traffic control device, street sign or other public structure or building, or any sign located in, on, over, or within a public street, sidewalk, alley, easement, or right-of-way.

13. Illuminated signs, illuminated from within or without, which

    a. are illuminated in such a manner, to high intensity, or without proper shielding, so as to constitute a hazard to the operation of motor vehicles upon a public street or substantially interfere with the reasonable enjoyment of residential property, or

    b. have any type of intermittent illumination, including flashing, fading, revolving, intermittently lighted, changing color or blinking lights, except those displaying time and temperature information only.

14. Balloons or other inflatable devices used as a sign.

15. Signs which display obscene, indecent or immoral matter.

16. Pole signs, unless approved by variance by the Zoning Board of Adjustment.

17. Painted wall signs.

East Dundee (Illinois), Village of. 2007. *Code of Ordinances.*

Title 15. Land Usage.
Chapter 156. Signs.

§ 156.02 Definitions.
For the purpose of this chapter, the following definitions shall apply unless the context clearly indicates or requires a different meaning.

Flashing Signs. Specifically noted as a lighted feature of a sign or light which has an intermittent connection from a power source to simulate motion or movement or distraction to the eye.

Sign.
(4) The term ***Sign*** shall include, but not be limited to the following categories, types and styles of signs.

(b) *Illumination and movement.*

1. ***Animated Sign.*** A sign which includes or incorporates action or movement.

4. ***Full Electronic Message Display.*** A sign capable of displaying words, symbols, figures or images that can be electronically or mechanically changed by remote or automatic means, including animated graphics and video.

9. ***Static Electronic Message Display.*** A sign capable of displaying words, symbols, figures or images that can be electronically or mechanically changed by remote or automatic means. Consistent with the definitions below, said displays shall change only through dissolve or fade transitions, or with the use of other subtle transitions and frame effects that do not have the appearance of moving text or images, but which may otherwise not have movement, or the appearance or optical illusion of movement, of any part of the sign structure, design or pictorial segment of the sign, including movement of any illumination or the flashing, scintillating or varying of light intensity.

a. ***Dissolve.*** A mode of message transition on an electronic message display accomplished by varying the light intensity or pattern, where the first message gradually appears to dissipate and lose legibility simultaneously with the gradual appearance and legibility of the second message.

b. ***Fade.*** A mode of message transition on an electronic message display accomplished by varying the light intensity, where the first message gradually reduces intensity to the point of not being legible and the subsequent message gradually increases intensity to the point of legibility.

c. ***Frame.*** A complete, static display screen on an electronic message display.

d. ***Frame effect.*** A visual effect on an electronic message display to change one message to another.

e. ***Transition.*** A visual effect used on an electronic message display to change from one message to another.

§ 156.03 General Regulations.

(F) *Movement.* Moving, rotating or animated signs or signs creating the illusion of movement shall be prohibited, except for those signs permitted to contain an electronic message display as per the provisions of an overlay district established within this chapter.

(G) *Illumination.* In addition to other applicable requirements set forth in this chapter, all illuminated sighs must comply with the following provisions.

(5) Illumination shall be constant in intensity and color, and shall not consist of flashing, animated, chasing, scintillating or other illumination conveying the sense of movement except for those signs that exhibit time and temperature or are permitted to contain an electronic message display as per the provisions of an overlay district established within this chapter.

(R) *Prohibited signs.*

(3) Flashing signs, except for those signs permitted to contain an electronic message display as per the provisions of an overlay district established within this chapter;

(T) *Electronic message display.*

(1) Notwithstanding the provisions included elsewhere in this chapter, electronic message displays containing a fully electronic message display consisting of words, symbols, figures or images that can be electronically or mechanically changed by remote or automatic means, including animated graphics and video shall be permitted as a special use for the following businesses:

(a) Gas stations.

(2) Signs with an electronic message display permitted as a special use are subject to the requirements set forth elsewhere in this chapter.

§ 156.04 Signs Regulated By Zoning District.

(D) ***Office districts (O-D).***

(1) *Site identification.* All signs in the O-D district shall be limited to the following.

(i) Flashing and rotating lights on signs are prohibited. All mechanical devices on signs are prohibited. External lighting is allowed.

(E) ***East Side Commercial Overlay District.***

(3) *Electronic message display.* For new car dealerships, gas stations, multi-tenant retail centers and amusement establishments only, the freestanding sign permitted in division (E)(2)(d)2., above, may contain a fully electronic message display consisting of words, symbols, figures or images that can be electronically or mechanically changed by remote or automatic means, including animated graphics and video, subject to the following:

(a) The area of the electronic message display shall not exceed 75% of the sign area.

(b) The intensity of illumination and the movement of any illumination or the flashing, scintillating or varying of light intensity shall not constitute a traffic hazard as described in § 156.03(E).

(F) ***Hilltop Commercial Overlay District.***

(3) *Electronic message display.* For new car dealerships, multi-tenant retail centers and amusement establishments only, the freestanding sign may contain a static electronic message display capable of displaying words, symbols, figures or images that can be electronically or mechanically changed by remote or automatic means, subject to the following:

(a) The area of the electronic message display shall not exceed 75% of the sign area.

(b) The electronic display shall contain static messages only. Said messages shall change only through dissolve or fade transitions, or with the use of other subtle transitions and frame effects that do not have the appearance of moving text or images, but which may otherwise not have movement, or the appearance or optical illusion of movement, of any part of the sign structure, design or pictorial segment of the sign, including movement of any illumination or the flashing, scintillating or varying of light intensity.

(c) Each message on the sign shall be displayed for a minimum of ten seconds.

(d) The intensity of illumination shall not constitute a traffic hazard as described in §156.03(E).

Homer (Alaska), City of. 2008. *City Code*.
Chapter 21.60. Supplemental Regulations.

Article 1. Sign Regulations.
21.60.010 Sign Code.

21.60.040 Definitions. For the purpose of this chapter, the following words and phrases shall have the meanings set forth in this chapter.

b. Animated sign. Any sign that uses flashing lights, movement or change of lighting to depict action or create a special effect or scene. A sign on which the only copy that changes is an electronic or mechanical indication of time or temperature shall be considered a "time and temperature" portion of a sign and not an animated sign for purposes of this chapter.

g. Changeable copy sign. A sign or portion thereof with characters, letters, or illustrations that can be changed or rearranged without altering the face or the surface of the sign. A sign on which the message changes more than one time per day shall be considered an animated sign and not a changeable copy sign for purposes of this chapter. A sign on which the only copy that changes is an electronic or mechanical indication of time or temperature shall be considered a "time and temperature" portion of a sign and not a changeable copy sign for purposes of this chapter.

21.60.060 Signs allowed on private property with and without permits.

a. Signs shall be allowed on private property in the City in accordance with, and only in accordance with Table 1 (see page 258-10). If the letter "P" appears for a sign type in a column, such sign is allowed without prior permit approval in the zoning district represented by that column. If the letter "S" appears for a sign type in a column, such sign is allowed only with prior permit approval in the zoning districts represented by tat column. Special conditions may apply in some cases. If the letter "N" appears for a sign type in a column, such a sign is not allowed in the zoning districts represented by that column under any circumstances.

b. Although permitted under the previous paragraph, a sign designated by an "P" or"S" in Table 1 shall be allowed only if:

> 1. The sum of the area of all building and free standing signs on the zone lot conforms with the maximum permitted sign area for the zoning district in which the lot is located as specified in Table 2 (see page 258-11);
>
> 2. The characteristics of the sign conform with the limitations of Table 3 (see page 258-12); "Permitted Sign Characteristics," and with any additional limitations on characteristics listed in Table 1 or Table 2.

c. Any sign not listed on the following tables are not permitted, with or without, a permit. (Ord. 90-43 1, 1990).

KEY TO Tables 1 through 3	
RR Rural Residential UR Urban Residential RO Residential Office INS Institutional Uses Permitted in Residential Zoning Districts CBD Central Business District GC1 General Commercial 1	GC2 General Commercial 2 MC Marine Commercial MI Marine Industrial OSR Open Space Recreation PS Public Sign Uses Permit

Table 3. Permitted Sign Characteristics by Zoning District

	RR	UR	RO	INS(a)	CBD	GCI	GC2	MC	MI	OSR	PS(e)
Animated(b)	N	N	N	N	S	S	N	S	N	N	N
Changeable Copy (c)	N	N	N	N	S	S	S	S	S	N	PH
Illumination Internal	N	N	N	S	S	S	S	S	S	N	N
Illumination External	N	N	N	S	S	S	S	S	S	N	PH
Neon(d)	N	N	N	N	S	S	S	S	S	N	N

P = Allowed without sign permit

S = Allowed only with sign permit

N = Not allowed

PH = Allowed only by approval of the Homer Advisory Planning Commission after a public hearing.

a. This column does not represent a zoning district. It applies to institutional uses permitted under the zoning code, in the RR, UR and RO zoning districts. Institutional is defined as an established organization or corporation of a

public, non-profit, or public safety/benefit natures,i.e., schools, churches, and hospitals.

b. Animated signs may not be neon or change colors or exceed three (3) square feet in area.

c. Changeable Copy signs must be wall or pole mounted, and nay not be flashing.

d. Neon signs may not be flashing and may not exceed thirty two (32) square feet.

e. This column does not represent a zoning district. It applies to Public Signs permitted under the zoning code, in all zoning districts. (Ord. 04-11(A) 6, 7, 2004; Ord. 03-38 8, 2003; 10/91 admin. Memo; Ord. 90-43 1, 1990).

CHAPTER 27.24

SIGN REGULATIONS

Sections:

27.24.010 **Purpose**
27.24.020 **Scope**
27.24.030 **Signs Prohibited**
27.24.040 **Permits Required**
27.24.050 **Signs Not Requiring Permits**
27.24.060 **General Standards for all Signs**
27.24.070 **Sign Area Allowances**
27.24.080 **Regulations for Specific Categories of Signs**
27.24.090 **Permitted Signs in Zones R-1, R-2, R-3, and R-4**
27.24.100 **Permitted Signs in Zones R-5, RA-1, RA-2, RA-3, B-1, P-1, and PUD**
27.24.101 **Permitted Signs in Zone H-1**
27.24.110 **Permitted Signs in Zones B-2, B-3, B-4, B-5, I-1, and I-2**
27.24.120 **Construction Standards**
27.24.130 **Maintenance**
27.24.140 **Sign Permit**
27.24.150 **Non-Conforming Signs and Signs Without Permits**
27.24.151 **Exemption for Historic Signs**
27.24.160 **Violations**
27.24.170 **Enforcement and Remedies**
27.24.180 **Removal of Signs by the Administrator**
27.24.190 **Appeals**
27.24.200 **Variances**

27.24.010: **Purpose.** The purpose of this Chapter shall be to coordinate the type, placement, and physical dimensions of signs within the different land-use zoning classifications of Kalispell; to recognize the commercial communication requirements of all sectors of the business community; to encourage the innovative use of design; to promote both renovation and proper maintenance; to promote the aesthetic objectives of the city; to improve pedestrian and traffic safety; to enhance the natural scenic qualities of the area; to minimize the possible adverse effect of signs on nearby public and private property; to promote the tourist economy of the city; and to guarantee equal treatment under the law through accurate record keeping and consistent enforcement. These shall be accomplished by regulation of the display, erection, use and maintenance of signs. The use of signs is regulated according to zoning classifications. No sign shall be permitted as an accessory use to a permitted or conditionally permitted use except in accordance with the provisions of this Chapter.

Used with permission.

27.24.020: **Scope.** This Chapter shall not regulate official traffic or government signs; the copy and message of signs; signs not intended to be viewed from a public right-of-way; product dispensers and point of purchase displays; scoreboards on athletic fields; flags of any nation, government or noncommercial organization; gravestones; religious symbols; commemorative plaques; decorative holiday light displays; traditional barber poles; the display of street numbers; or any display or construction not defined herein as a sign.

27.24.030: **Signs Prohibited.** The following types of signs are prohibited in all districts: No permit shall be issued for the erection of any signs prohibited by this section.

(1). Abandoned Signs.

(2). Inflatable signs, searchlights, beacons or other gas filled or air filled figures. (except as allowed in Section 27.24.050(1)(c)

(3). Banners on public property or rights-of-way, except as otherwise permitted by other city standards or policies.

(4). Signs imitating or resembling official traffic or government signs or signals.

(5). Snipe signs or signs attached to trees, telephone/electrical poles, public benches, streetlights, or placed on any public right-of-way.

(6). Signs placed on vehicles or trailers which are parked or located for the primary purpose of displaying said sign. (This does not apply to signs or lettering on buses, taxis, or vehicles operating during the normal course of business.)

(7). Roof Signs unless architecturally incorporated into the facade of the building on a parapet wall or similar extension of an exterior wall.

(8). Any temporary or portable signs except as otherwise permitted in Section 27.24.050(1).

(9). Mechanically animated and/or flashing signs. See also Section 27.24.060(1)

(10). Any temporary or portable sandwich board signs or other portable signs located on public sidewalks or in the public right-of-way.

27.24.040: **Permits Required.** Unless otherwise provided by this ordinance, all signs shall require permits and payment of fees as described in Section 27.24.140 of

(8). **Nameplates.** One per dwelling or tenant names at main entrance of any non-residential use not exceeding one square foot per nameplate.

(9). **Incidental Signs.** Signs that are generally informational, that have a purpose secondary to the use on the lot on which it is located, such as "no parking," "entrance," "loading only," "telephone," and other similar directives. No sign with a commercial message legible from a position off the zone lot on which the sign is located shall be considered incidental.

(10). **Works of art** that do not include a commercial message.

27.24.060: General Standards for all Signs.

(1). Signs shall not rotate, move, flash, change or blink, except if utilized by a government agency for public safety or information.

(2). An electronic message board provided it displays time and temperature a minimum of every 30 seconds. The electronic message shall not change in increments of less than five seconds and shall not use flashing or blinking characters. The use of red and green lights in the display and streaming video are prohibited.

(3). Signs, if illuminated, shall be lighted by continuous, stationary, shielded light sources. Internally illuminated signs may not be lit at night when any face of the sign is removed or damaged in such a way that the light may distract or intrude on drivers or adjacent properties. Signs that have exterior lighting must be lit from above the sign and the light shielded except that ground lighting may be used for ground mounted signs with a solid base. In all cases lighting must be directed at the surface of the sign area.

(4). Portable or movable reader boards signs are prohibited except when used to announce a temporary event [see 27.24.050(1)(c)] or when used in conjunction with temporary businesses and shall be placed at least 15 feet back from the public right-of-way.

(5). A sign may include electronic and manually changeable reader boards. No more than 25% of any sign area may incorporate an electronic reader board, and no more than 50% of any sign area may incorporate a manually changeable reader board. In no event shall the percentage of sign area occupied by reader board exceed 50%. The reader board portion shall be architecturally incorporated into the overall design of the sign. No such sign shall be considered to be architecturally

incorporated unless the reader board is contiguous to the remainder of the sign face and is bounded by the same or similar framework.

(6). Signs attached to buildings shall not extend above the wall to which they are attached unless erected to comply with 27.24.030(8).

(7). The advertising display area for freestanding signs shall include no more than two faces except that more than two faces may be permitted for signs serving multiple businesses. The advertising display area for wall signs shall be limited to a single sign face.

(8). No off-premise sign shall be located in any residential zoning district except as may be associated with incidental neighborhood sales [as per Section 27.24.050(1)(e). See also Section 27.24.030.

27.24.070: **Sign Area Allowances.** The maximum sign area allowance for a particular property shall be calculated as per subsection (1) or (2) below unless otherwise specified in this Chapter. Sign area allowances shall only be applicable to developed properties, and shall include all conforming and nonconforming signage for which permits have been issued per Section 27.24.150.

(1). Building Frontage Length.

(a). When building frontage is less than 200 feet, the maximum sign area for the property shall be as follows:

1) B-2, B-3, B-4, B-5, I-1, and 1-2 zones: three square feet for each lineal foot of building frontage length.
2) R-5, RA-1, RA-2, RA-3, B-1, and P-1 zones: two square feet for each lineal foot of building frontage length.
3) R-1, R-2, R-3, and R-4 zones: one square foot for each lineal foot of building frontage length.
4) H-1 zone: See Section 27.24.101.

(b). When building frontage exceeds 200 feet, the maximum sign area shall be equal to the maximum sign area calculated under subsection (a) of this section plus one square foot for each additional lineal foot of frontage beyond 200 feet.

(c). In the B-2, B-3, B-4, B-5, I-1 and 1-2 zones, shopping centers or lots containing multiple businesses or where common signage

Maple Valley (Washington), City of. 2008. *Municipal Code*.
Chapter 18.50. Particular Use Regulations.

18.50.010 Signs.

B. Definitions. The following words, terms and phrases, when used in this code, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

4. "Animated sign or display" means a sign or display that uses movement or the appearance of movement through the use of patterns of lights, changes in color or light intensity, computerized special effects, video displays, or through any other method; except for the scrolling of a static message or scene onto or off a sign board in one direction per message.

14. "Changeable copy sign (other than electronic changeable message sign)" means a sign whose informational content can be changed or altered (without changing or altering the sign frame, sign supports or electrical parts) by manual or mechanical means.

24. "Electronic changeable message sign" means an electronically activated sign whose message content or display, either whole or in part, may be changed by means of electrical, electronic or computerized programming. A sign or portion of a sign on which the message or display is an electronic indication of fuel price shall be considered an electronic changeable message sign. A sign on which the sole message or display is an electronic indication of time and/or temperature shall be considered an electronic changeable message sign. Drive-through business/menu signs are not considered electronic changeable message signs.

29. "Flashing sign" means a sign of which any portion of it changes light intensity, switches on and off in a constant pattern, or contains moving parts or the optical illusion of motion caused by use of electrical energy or illumination, with a display that appears for less than one and one-half consecutive seconds.

38. "Holographic sign or display" means any sign or display that creates a three-dimensional image through projection.

50. "Moving sign" means any sign that uses movement, by either natural or mechanical means, or change of lighting, either natural or artificial, to depict action to create a special effect or scene; or signs that rotate or have a part(s) that moves or revolves (except the movement of the hands of a clock).

72. "Scrolling displays" means the vertical movement of a static message or display on an electronic changeable message sign.

80. "Time and temperature sign" means any sign that displays the current time and temperature, without any commercial messages.

81. "Traveling displays" means the horizontal movement of a static message or display on an electronic changeable message sign.

D. Prohibited Signs. The following signs or displays are prohibited in all zones within the City. Prohibited signs are subject to removal by the City at the owner or user's expense. Confiscated signs are destroyed after seven days. Owners may recover their signs within that time period by paying a fine prescribed in the fee schedule.

3. Animated signs or displays;

6. Electronic changeable message signs, except for temporary signs required by government agencies for road and street repairs, and similar activities. This prohibition includes, but is not necessarily limited to, signs which include animation, flashing, traveling, or scrolling messages or displays;

7. Flashing signs or displays;

9. Holographic signs or displays;

12. Moving signs;

19. Scrolling displays;

22. Traveling displays;

Chapter 21

Sign Regulations

Section 21-1 Purpose

The purpose of this chapter is to establish regulations for the erection and use of signs and outdoor advertising within the City limits of Tavares. These regulations are established to provide reasonable advertising and identification of businesses within Tavares while also protecting the health, welfare and safety of the citizens of Tavares by reducing the adverse effects of signage and displays on highway safety, building safety, property values and the aesthetic enjoyment of the City. These regulations are further intended to avoid excessive competition and visual clutter among sign displays in the demand for public attention.

Section 21-2 Definitions

For the purpose of this chapter, the terms, phrases, and definitions contained below shall apply. Words used in the singular shall include the plural, and the plural, the singular. Words used in the present tense shall include the future tense. The word "shall" is mandatory and not discretionary. The word "may" is permissive. Words not defined herein shall be construed to have the meaning given by common and ordinary use as defined by the latest edition of *Webster's Dictionary*.

Abandoned Sign - A sign which no longer serves to advertise a bona fide business conducted, service performed or product sold where such business, service or products have been discontinued for a period of twelve (12) months.

Accessory Sign - A permanent ground or building sign that is permitted under these regulations as incidental to an existing or proposed use of land.

Advertising - Sign copy intended to directly or indirectly promote the sale or use of a product, service, commodity, entertainment, or real or personal property.

Banner Sign - A strip of cloth or similar material, not permanently affixed to a frame or surface, on which a sign is painted, generally suspended between poles or structures by cloth straps or ropes and is intended as a temporary sign.

Bench Sign - A sign located on any part of the surface of a bench or seat.

Billboard - A permanent ground sign supported by one or more poles attached to which is a sign area which is at least two-hundred square feet (200') in size and which is used or installed to attract attention to a place or product sold, other than at the location of said sign.

Building Sign - A sign displayed upon or attached to any part of the exterior of a building, including walls, windows, doors, parapets, marquees and roof slopes of forty-five (45°) degrees or steeper.

Change In Use - A change in use of property occurs whenever the essential character or nature of the activity conducted on a lot changes. This occurs whenever:

(1) The change involves a change from one principal use category to another.

(2) The use changes to such an extent that the parking requirements for the overall use are increased.

(3) A land use within a Planned Development is added or amended which increases the overall

Used with permission.

intensity of development within the PD.

(4) A business or enterprise, different in type and category, intends to operate from the same lot, property and/or space from the previously existing business or enterprise.

(5) A change in the status of property from unoccupied to occupied or vice versa does not necessarily constitute a change in use. Whether a change in use occurs shall be determined by comparing the two active uses of property without regard to any intervening period during which the property may have been occupied, unless the property has remained unoccupied for more than one-hundred-and-eighty (180) consecutive days or has been abandoned.

(6) A change in ownership of a business or enterprise or a change in the name shall not be regarded as a change in use.

(7) The intent of these provisions is to provide for the elimination of non-conforming structures and uses consistent with Policy 1-1.6.1 of the City of Tavares Comprehensive Plan unless special circumstance exist as determined by the City Council.

Commemorative Sign - A sign located in public rights-of-way, which serves as a memorial to individuals or organizations, for donated community improvements such as ornamental plants, statues and signs.

Construction Sign - A sign giving the names of principal contractors, architects and lending institutions responsible for construction of the site where the sign is placed, together with other information included thereof.

Copy - The linguistic or graphic content of a sign.

Copy Area - The advertising display surface area encompassed within any sign.

Directory Sign - A sign on which the names and locations of occupants or the use of a building is given. This shall include office building and church directories.

Electric Sign - Any sign containing electric wiring.

Erect A Sign - To construct, reconstruct, build, relocate, raise, assemble, place, affix, attach, create, paint, draw, or in any other way bring into being or establish; but it shall not include any of the foregoing activities when performed as an incident to the change of message, or routine maintenance.

Flashing Sign - Any sign which contains an intermittent or flashing light source, or which includes the illusion of intermittent or flashing light by means of animation, or an externally mounted intermittent light source. Automatic changing signs such as time and temperature or public service item signs are not considered as flashing signs.

Frontage - The length of the property line of any one (1) parcel along a street on which it borders.

Ground Sign - A sign that is erected on the ground and whose base or means of support is concealed or enclosed.

Harmful to Minors - With regard to sign content, any description or representation, in whatever form, of nudity, sexual conduct, or sexual excitement, when it:

(1) predominately appeals to the prurient, shameful, or morbid interest of minors in sex, and

(2) is patently offensive to contemporary standards in the adult community as a whole with respect to what is suitable sexual material for minors, and

(3) taken as a whole, lacks serious literary, artistic, political, or scientific value.

(4) The term "harmful to minors" shall also include any non-erotic word or picture when it:

(a) Is patently offensive to contemporary standards in the adult community as a whole with respect to what is suitable for viewing by minors, and

(b) taken as a whole, lacks serious literary, artistic, political, or scientific value.

Illuminated Sign - A sign which contains a source of light or which is designed or arranged to reflect light from an artificial source including indirect lighting, neon, incandescent lights, back-lighting, and shall also include signs with reflectors that depend upon automobile headlights for an image.

LED Sign – Light Emitting Diode (LED) sign utilizing technology of diodes arranged in pixels to create messages changeable by electronic means. Said signs are sometimes referred to as electronic message centers and shall include other similar signs such as liquid crystal display signs, fiber optic signs, plasma display screen signs, incandescent signs, time-temperature-date signs or any other such sign using similar technologies.

Marquee - A permanent, roof-like structure supported by a building, generally designed and constructed to provide protection from weather, which extends beyond the building line or property line and fully or partially covers a sidewalk, public entrance or other pedestrian way.

Multiple Occupancy Complex - A commercial use, i.e. any use other than residential or agricultural, consisting of a parcel of property, or parcel of contiguous properties, existing as a unified or coordinated project, with a building or buildings housing more than one occupant.

Non-Commercial Signs - Any sign that addresses issues of public concern and does not advertise any activities being conducted for profit or private gain, nor solicits contributions of any kind.

Off-Site Sign – A sign, either attached to a building or other structure located on real property, which is not appurtenant to the use of the real property where the sign is located or which does not advertise a service offered at the location where the sign is placed or which does not identify a business located where the sign is placed as a purveyor of the merchandise or services advertised on the sign. The term "Off-Site Sign" includes, but is not limited to, signs commonly known as billboards.

On-Site Sign – A sign that identifies or advertises only goods, services, facilities, events or attractions available on the premises where the sign is located.

Owner - The owner of property, the tenant, agent, or person having the beneficial use of the building, structure, or property upon which a sign may be located.

Parcel or Parcel of Land - A contiguous quantity of land in possession of, owned by, or recorded as property of the same claimant person in the public records of Lake County, Florida, as of the effective date of this chapter.

Permanent Sign - Designed, constructed and intended for more than short-term use.

Pole Sign - a sign supported by poles, uprights or braces which are not enclosed in a concealed base but are permanently placed on or in the ground and wholly independent of any building for support. This definition should not be construed to mean monopole style off-site signs.

Political Sign - Any temporary sign which publicizes any political candidate, party, referendum, or election.

Portable Sign - Any sign which is manifestly designed to be transported by trailer, or on its own wheels, or other means including such signs even though the wheels may be removed and the remaining chassis or support structure converted to an A or T frame sign and attached temporarily or permanently to the ground.

Reader Board - a sign designed to accommodate changeable copy including, but not limited to, individual letters and numbers that can be removed and replaced by hand. Electronic message centers are not considered part of this definition.

Real Estate Sign - Any sign which is used to offer for sale, lease or rent, the property upon which the sign is placed.

Roof Line - A horizontal line intersecting the highest point or points of a roof.

Roof Sign - A sign placed above the roof line of a building or on or against a roof slope of less than forty-five degrees (45°).

Shingle Sign - A sign over a show window or door of a store or business establishment announcing only the name of the proprietor and the nature of the business. The sign shall be supported by a bracket or chains substantial enough to withstand the forces of wind and shall not exceed two-and-one-half square feet (2-1/2') in sign area.

Sign - Any writing, pictorial presentation, number, illustration, or decoration, flag, banner or pennant, or other device which is used to announce, direct attention to, identify advertise or otherwise make anything known. The term sign shall not be deemed to include the terms "building" or "landscaping" or any architectural embellishment of a building not intended to communicate information, nor any holiday lights or decorations.

Sign Face - The part of a sign that is or may be used for copy.

Sign Area - The area of any regular geometric shape, which contains the entire surface area of a sign upon which copy may be placed.

Sign Structure - Any construction used or designed to support a sign.

Special Event Signs - Signs, including window signs, grand opening displays and poster signs which are used to advertise a promotional venture such as the opening of a business, closing of a business or special sale.

Street - A public or private right-of-way for vehicular traffic, including highways, thoroughfares, lanes, roads, ways, and boulevards.

Temporary - Designed, constructed, and intended to be used on a short-term basis.

Vehicle Sign - Any sign affixed to a vehicle.

Wall Sign - A sign attached to or erected against the wall of a building with the face in a parallel plane of the building. Signs attached or erected against roofs of forty-five degrees (45°) or greater slope shall also be considered a wall sign.

Window Sign - A permanent sign affixed to, suspended behind or painted on either face of a window or glass door that reads to the exterior of the building.

Section 21-3 Prohibited Signs

The following signs are expressly prohibited unless exempted by another section of these regulations:

(A) Signs that are in violation of the *Standard Building Code* or The *National Electrical Code* as adopted by the City.

(B) Signs, other than official traffic signs or commemorative signs, erected within the right-of-way lines of any street or public way without approval of the City Administrator or designee. Commemorative signs placed in the right-of-way shall become the property of the City.

(C) Any sign that, in the opinion of the City Administrator or designee, does or will constitute a safety hazard.

(D) Blank temporary signs.

(E) Signs with visible moving, revolving, or rotating parts or visible mechanical movement of any description or other apparent visible movement achieved by electrical, electronic, or mechanical means, except for traditional barber poles. This is not intended to prohibit billboards whose copy may be changed or rearranged electronically or mechanically without altering the sign structure.

(F) Signs with lights or illuminations that flash, move, rotate, scintillate, blink, flicker, or vary in intensity or color, except for time-temperature-date signs and LED signs as provided for in Section 21-19.

(G) Strings of light bulbs used on commercially developed parcels for commercial purposes, other than traditional holiday decorations.

(H) Signs, commonly referred to as wind signs, consisting of one or more banners, flags, pennants, ribbons, spinners, streamers or captive balloons, or other objects or material fastened in such a manner as to move upon being subjected to pressure by wind; except as permitted in Section 21-15 of these regulations.

(I) Signs that incorporate projected images, emit any sound that is intended to attract attention, or involve the use of live animals.

(J) Signs that emit odor or visible matter such as smoke or steam.

(K) Signs that resemble any official sign or marker erected by any governmental agency, or that by reason of position, shape or color, would conflict with the proper functioning of any traffic sign or signal, or be of a size, location, movement, content, color, or illumination that may be reasonably confused with or construed as, or conceal, a traffic control device.

(L) Signs that obstruct the vision of pedestrians, cyclists, or motorists traveling on or entering public streets.

(M) Non-governmental signs that use the words "stop", "look", "danger", or any similar word, phrase or symbol and that mimic a traffic control sign.

(N) Signs, within ten feet (10') of public right-of-way or one-hundred feet (100') of traffic control lights, that contain red or green lights that might be confused with traffic control lights.

Section 21-19 LED Signs

Light Emitting Diode Signs, or LED Signs, may be permitted under the following conditions:

(A) LED signs may only be permitted in the C-1, C-2 and PFD zoning districts.

(B) LED signs may only be permitted as part of a ground sign that complies with the applicable provisions of this chapter.

(C) The copy area of any LED message screen shall be no greater than twenty square feet (20'). per sign face. Said LED copy area applies toward the maximum amount of signage copy area permitted per each site regardless of whether the LED portion of the sign is illuminated or utilized.

(D) LED lines for messages shall not exceed three (3) lines of LED text per each sign face.

(E) LED signs are restricted to one (1) color of LED for the entire message screen.

(F) Messages displayed through an LED message screen may scroll, but shall not blink, flicker, flash, scintillate or be otherwise animated.

Section 21-20 Variance

A variance to these sign regulations may be requested as set forth in *Chapter 4* where such variances will not be contrary to the public interest and where, owning to special conditions, a literal enforcement of the provisions of this sign code would result in unnecessary hardship.

SECTION 25
SIGNS

Updated by Ordinance 1208 on May 22, 2006
Updated by Ordinance 1243 on September 24, 2007

25-010 PURPOSE

a. The purpose of this section is to recognize the community's need for effective individualized identification, to prevent confusing and objectionable clutter, to promote traffic safety, to protect property values by enhancing the harmony between residential and commercial uses, and to preserve, protect and promote the public health, safety and general welfare.

b. These regulations are adopted to assure fair and consistent regulation of signs within the City. No land, building or structure shall be used for signage purposes except as specified herein.

25-011 DEFINITIONS.

1. "A" Frame Sign: A freestanding sign which is ordinarily in the shape of an "A" or some variation thereof, which is readily moveable, and is not permanently attached to the ground or any structure.

2. Abandoned Sign: A sign which no longer advertises or identifies a business, lessee, owner, product, activity, message or location that is available to the public.

3. Animated Sign: A sign that has movement or the appearance of movement of either the sign content or components, which is produced either mechanically or electronically.

4. Attention-Attracting Device: Any device intended to attract the attention of the public to an establishment, location, product or service, except signs as permitted by this ordinance. Such device or sign may include balloons, flags or pennants, search lights, twirling signs, inflatable objects, etc.

5. Average Grade: The area immediately below and within a radius of 20 feet of a sign.

6. Awning: A roof-like cover that projects from the wall of a building for the purpose of shielding a doorway, walkway, or window from the elements. Awnings are often made of fabric or flexible plastic supported by a rigid frame, and may be retracted into the face of the building.

7. Awning/Canopy/Marquee Sign: A sign painted, stamped, perforated, stitched, mounted or otherwise applied on the valance of an awning or canopy.

Used with permission.

8. Billboard: A sign that directs attention to a business, commodity, service, or entertainment conducted, sold, or offered at a location other than on the premises on which the sign is located.

9. Bulletin or Poster Case Sign: A sign that indicates the name of the organization, institution, or business on whose premises it is located and which contains the name or names or persons connected with it, and announcements of persons, events or activities occurring on the premises. Such sign may also present a greeting or similar message.

10. Canopy:
    a. Building Canopy: A roof-like structure attached to a building covering the entrance, exit, walkway, or loading dock, not including the building roof line extension. For the purpose of this ordinance, when the pitch of a building canopy is 1:4 or less (twenty-five [25] degrees or less from vertical), the face of the canopy shall be considered part of the wall.
    b. Freestanding Canopy: A self-supported, detached roof-like structure, such as a structure covering gas fueling stations.

11. Community Information Signs: A sign located within a planned community, that serves to direct people to a residential subdivision, public building, or community facility such as, but not limited to, a recreational area, nature trail, golf course, information area, etc.

12. Community Interest Signs: A sign that is sponsored by a recognized local non-profit organization whose purpose is to display messages of public interest and which does not display any advertising for any goods or services offered by any business, retailer or commercial interest.

13. Complex: A group of freestanding buildings, or buildings constructed in such a manner as to give an appearance of being interrelated because of architectural similarity and/or interconnected drives and parking areas; or a building divided into three (3) or more separate offices, businesses, or apartments provided that building is not part of a large complex. A complex shall be limited to apartment, office or business complexes, shopping centers and/or industrial parks.

14. Directory Sign: A single-faced, non-illuminated wall sign that displays only the name and occupation of the person or persons occupying space in the building.

15. Directional Sign: A sign that indicates the distance, direction, or activity on the premises, such as "exit," "one-way," "drive-in," "auto service," etc.

16. Electronic Message Board: Uses changing lights to form a sign message(s) or symbols that are electronically programmed and can be modified by electronic processes.

17. Flashing Sign: A sign that gives the effect, either directly or indirectly, of intermittent movement, or changes to give two or more visual effects.

18. Identification Sign: A sign giving the name and address of a structure, business development, or establishment. Such signs may be a wholly or partly devoted to a readily recognized symbol.

19. Illuminated Sign: A sign illuminated in any manner by an artificial light source.

20. Incidental Sign: A sign providing information about the occupancy or conduct of business permitted on a premises, such as logos of credit cards accepted on the premises, hours of operation, a "closed" or "open" sign, emergency contact name and phone number, street address, "help wanted", "no loitering or solicitations", security system notices, notices required by law, and similar signs shall be construed to be incidental signs.

21. Indirectly Illuminated Sign: A sign which is illuminated by a shielded light source.

22. Internally Illuminated Sign: A sign illuminated by an internal light source diffused through a translucent material.

23. Inflatable Sign: A sign that is intended to be expanded by air or other gas for its proper display or support.

24. Lights: The following lights are not allowed on a sign, as a sign, or in conjunction with a sign within the City of Tonganoxie:
    a. Search Light: A projected beam of light.
    b. Twirling or flashing lights: Lights that flash or twirl either erratically or rhythmically for the purpose of drawing attention to an object or event.
    c. Strobe Light: A device that utilizes a flash-tube for high-speed illumination.
    d. Disco Balls: A sphere with miniature mirrored or reflective tiles attached to the surface for the purpose of reflecting light in many directions.

25. Monument Sign: A freestanding sign mounted on the ground and having a solid appearance and a low profile, normally consisting of a face and base. The width and length of the supporting base shall be no less than the sign face.

26. Mural: Any picture, scene, or diagram on an exterior wall or fence generally for the purposes of decoration or artistic expression, including painting, fresco, or mosaic, and not interpreted by the City Planner to be advertising. Murals with advertising shall be considered oversized wall signs.

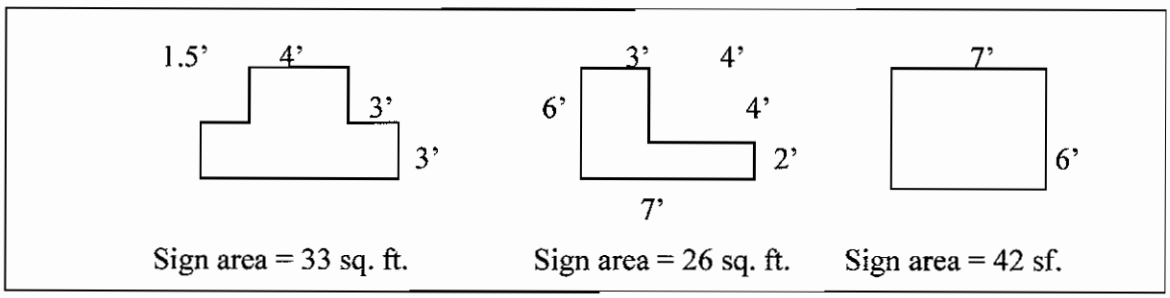
27. Name Plate: See Directory Sign.

2. The City Clerk shall mail a statement of the costs for removal or repair of the unsafe or unlawful sign to either the last known address of the owner of record of the property, the person in charge of such property, or the sign permittee. If said costs are not paid within ten (10) days from the time of mailing the notice, the Governing Body of the City may proceed to pass an ordinance levying a special assessment for the cost against the subject lot or parcel of land. The City Clerk shall certify the assessment to the County Clerk for collection and payment to the City in the same manner as other assessments and taxes are collected and paid to the City.

25-013 GENERAL STANDARDS

a. Area Measurement:

1. The surface area of a sign shall be calculated by enclosing the extreme limits of all lettering, background, emblem, logo, representation, or other display within a single continuous perimeter composed of squares or rectangles with no more than eight lines drawn at right angles. (See below)



2. Supporting framework or bracing that is clearly incidental to the display itself shall not be computed as sign area.

3. Double-faced (back-to-back) signs shall be regarded as a single sign only if mounted on a single structure, and the distance between each sign face does not exceed two feet at any point. Only one face of a double-faced sign shall be measured when determining maximum allowable area. In the case of different sign faces, the face with the largest computed sign area shall be used.

4. Three-dimensional objects, sculpture or trademarks that project from the face of the sign shall be measured at their maximum projection upon a vertical plane. No object may project more than six (6") inches from the sign face.

5. Time and temperature devices shall be excluded from the computation of sign area unless they are an integral part of the sign

6. Maximum sign area is per site, not per sign.

b. Content: The text of permanent signs shall relate only to the name and/or nature of the business or service. Permanent signs that advertise continuous sales or special prices shall not be allowed except as in bulletin signs or service station signs. It shall be unlawful to display any sign that is deemed by the Governing Body to be obscene, indecent or immoral.

c. Height Measurement: The height of a sign shall be measured as the vertical distance from the uppermost point of the structural to the average grade immediately below and within a radius of 20 feet of the supporting structural member(s) of the sign.

d. Illumination: The following standards are applicable for all illuminated signs to reduce any negative impacts upon surrounding neighborhood or right-of-way areas.

1. External light sources shall be directed and shielded to limit direct illumination of any object other than the sign.
2. The light from an illuminated sign shall not be of an intensity or brightness that will create a negative impact on residential properties in direct line of sight to the sign.
3. Signs shall not have blinking, flashing, or fluttering lights, or other illuminating devices that have a changing light intensity, brightness or color.
4. Colored lights shall not be used at a location or in a manner so as to be confused or construed as traffic control devices.
5. Reflective type bulbs and incandescent lamps that exceed 15 watts shall not be used on the exterior surface of signs so that the face of the bulb or lamp is exposed to a public right-of-way or adjacent property.

e. Maintenance: All signs shall be of sound structural quality, be maintained in good repair, have a clean and neat appearance, and land within ten (10) feet in any direction from the base of the structure or wall shall be kept free from debris, weeds and trash.

1. General maintenance of said sign shall include the replacement of nonfunctional, broken, or defective parts, painting, cleaning and upkeep of the premises immediately surrounding the sign or advertising structure, and any other action required for the maintenance of said sign or advertising structure. All signs and supporting structures shall be kept painted or treated in some manner to prevent rust, decay or deterioration.

2. If signs are not maintained as described and the Code Enforcement Officer deems them a public safety hazard or nuisance, such signs shall be removed. All costs for removal of said sign shall be assessed against the property owner.

3. Should any sign, which is placed in a public easement, be damaged due to maintenance of utilities in that easement by the City or others, the cost for repairs or replacement of said sign shall be borne by the sign owner.

f. Removal or Replacement: A sign shall be removed by the owner or lessee of the premises within 90 days of the discontinuance of the business that it advertises. When a sign is removed, all brackets, poles, and other structural elements that supported the sign shall also be removed. Affected building surfaces shall be restored to match the adjacent portion of the structure.

g. Placement on Easement or Right-of-Way: No privately-owned sign shall encroach into a public right-of-way, except as noted under projecting building signs. No private sign shall be placed on a public easement, unless, in the opinion of the City Engineer, such placement will not interfere with the intended use of said easement.

h. Setbacks: Unless otherwise stated, all signs shall observe a minimum fifteen (15) foot setback from the property line.

i. Sight Distance at Intersections: No sign, which obstructs the view, shall be allowed within the sight triangle of a street intersection as described in Section 32-010.

j. Canopy or Awning Sign: This type sign is permitted as an integral part of the awning or canopy to which they are attached or applied.

1. Signs may be lettered on awnings located on a one- or two-story building. Awnings may be at either level of the building, and may face a parking lot, street right-of-way or a pedestrian walkway.
2. Sign area shall occupy no more than thirty-five (35) percent of the canopy/awning.
3. The lower edge of a canopy shall be no closer than ten (10) feet to any sidewalk nor fourteen (14) feet to any street or alley surface where vehicles may pass below.
4. Awnings or canopy signs may not be internally lighted. Lighting directed downward and not illuminating a sign is allowed.
5. Awnings and canopies shall be regularly cleaned and kept free of excessive dust or visible defects.

k. Changeable Copy Sign: These include marquees, electric/electronic/mechanical signs, service station signs, etc. Due to the highly distracting nature of many such signs, they must be approved by the Planning Commission. The Commission shall consider affect on area, location and sign format or programming when evaluating. Allowed (with approval) in all districts, but limited to church, school, public and semi-public uses in residential areas. These signs may be strictly limited in areas where they may cause a traffic hazard or nuisance or disruption to the surrounding neighborhood.

l. Monument Sign:

1. A monument sign may be located only within a site frontage adjoining a public street.
2. A monument sign may be single or double-faced. Maximum area of a sign shall be sixty (60) square feet, with no sign face exceeding thirty (30) square

b. If that person does not remove or replace the temporary event sign in accordance with this chapter, then the property owner or occupant of the building lot where the sign is posted is responsible for the sign's removal or replacement.

c. City staff is authorized to remove any temporary event signs posted in violation of this chapter that are not removed or replaced in accordance with the provision above. Temporary signs posted on private property in violation of this chapter shall be deemed a public nuisance, and the Code Enforcement Officer may abate that nuisance in accordance with Section 25-022.

d. The Code Enforcement Officer may immediately remove temporary event signs posted on public property or rights-of-way in violation of this chapter.

r. Attention-Attracting Devices or Signs: Such devices or signs shall be permitted upon approval by the Planning Commission as a temporary, limited condition. Approval of such devices or signage shall contain a specified time limit, including a date for removal of the devices or signage and restoration of the site.

25-014 SIGNS PERMITTED IN ALL DISTRICTS

The following signs shall be permitted in all districts and shall not require a sign permit, unless otherwise noted. The signs must be in conformance with all other regulations and ordinances of the City.

a. Address Numbers: Address numbers shall not exceed four (4) square feet.

b. Bulletin boards / Poster Case: These signs when placed on the exterior of a building are limited to church, school, public and semi-public uses as well as, theaters and auditoriums upon approval by the Planning Commission. Such signs shall not exceed sixteen (16) square feet in area.

c. Community Interest Signs: Such signs may only be placed on property owned by the sponsoring organization. A request may be presented to place such sign in public right-of-way. An application to place a community interest sign must be presented to and approved by the Tonganoxie City Council who shall consider each request on a case-by-case basis including considerations such as size, appearance, location for placement, liability, and commitments from the sponsor limiting the content of displayed messages. The sponsoring organization shall be responsible for installation and maintenance of such signs.

d. Directional Signs: Such signs shall not exceed four (4) square feet per face with two (2) faces permitted. The sign shall not exceed four (4) feet in height if freestanding.

e. Flags and insignia of any government jurisdiction, including flags indicating weather conditions and flags which are emblems of religious, charitable, public, and

ten (10) percent of the area of the wall, upon which it is mounted, with the maximum sign area per wall not to exceed one-hundred fifty (150) square feet.

b. Monument Signs:

1. In lieu of one (1) of the above permitted wall signs, one (1) monument sign shall be permitted for each freestanding building housing one (1) tenant.

2. In addition to the signs permitted above, each complex as defined by Section 25-011 shall be permitted one (1) monument (identification) sign with the names of tenants.

3. Commercial complexes or single business sites on property more than ten (10) acres and more than one (1) street frontage or more than one thousand (1,000) linear feet of street frontage shall be permitted a second monument sign.

4. When a commercial complex is located on a site more than ten (10) acres in area, one (1) of the two (2) permitted monument signs may be increased to a maximum height of twenty-one (21) feet and a maximum face area of ninety-five (95) square feet; on a site more than twenty (20) acres, both of the two (2) monument signs may be increased in height to twenty-one (21) feet and a maximum face area of ninety-five (95) square feet. Monument signs for industrial park complexes shall be limited to the size, height, and sign face area as defined in Section 25-013.

c. Temporary Event Signs: Same as permitted in Section 25-017.

d. Attention-Attracting Devices or Signs: Same as permitted in Section 25-017.

25-019 OVERSIZED SIGNS

a. This section provides for both standard and creative signs as follows: business district or multi-tenant center signs, large screen video signs and oversized wall signs. **Additional billboards shall not be allowed within the City limits**. All applications for an oversized sign must be reviewed and approved by the Planning Commission according to the following criteria.

1. Sign is in character with the surrounding area and will not negatively impact surrounding properties.
2. Sign shall not interfere with pedestrian or vehicular safety as determined by the City Engineer and/or the City Superintendent.
3. Sign does not detract from the pedestrian quality of the surrounding area.
4. Sign shall not contribute to an over-proliferation of signs on one property or in an area.
5. Sign shall be maintained in a safe and aesthetically pleasant condition.
6. To guarantee removal of the sign should it be abandoned or become in a state of disrepair, the owner shall post a bond equal to the cost of removal of the sign.

b. Oversized Wall Signs. Located in areas such as along fences at the fairgrounds or other sports fields in the city, and including murals covering large areas of a building's surface.

1. Fairgrounds/Sports Arenas/Athletic Fields.
   a. Signs shall be allowed along the enclosing fences at the Leavenworth County Fairgrounds or along the fencing of other sports fields and athletic complexes.
   b. All signs must face inward toward playing fields and have limited visibility from surrounding properties
   c. Such signs shall not extend above the upper edge of the fence or a maximum of eight (8) feet in height as defined in Section 25-013.C, whichever is least.
   d. Lighting may be provided according to the conditions in Section 25-013.D.

2. Mural Type Signs.
   a. Such signs may be allowed at the discretion of the Planning under the guidelines for Creative Signs in this section.

c. Large Screen Video Signs and Scoreboards.
   1. This type of sign shall be intended for sports complexes or other public facilities. The screen or scoreboard shall be directed principally toward the site, not off-site.
   2. No more than one large screen or scoreboard shall be permitted per development/site.

25-020 CREATIVE SIGNS

a. Purpose. This section is provided in order to encourage signs of unique design that exhibit a high degree of thoughtfulness, imagination, inventiveness and spirit. Creative signs will be allowed when they are use to make a positive visual contribution to the overall image of the City.

b. Application. A separate application is required that addresses the specific standards in this section. Materials submitted must be able to depict the following criteria sufficiently for a review to be made. This application must be approved by the Planning Commission

c. Design Criteria.
   1. Design Quality.
      a. The sign shall constitute a substantial aesthetic improvement to the site and provide a positive visual impact on the surrounding area.
      b. It shall be of unique design and exhibit a high degree of thoughtfulness, imagination, inventiveness, and spirit.
      c. The sign shall provide strong graphic character through the imaginative use of graphics, color, texture, quality materials, scale, and proportion.
   2. Context. The sign shall contain at least one of the following elements:

a. Creative image reflecting the current or historic character of the City; or
b. Symbols or imagery relating to the entertainment or design industry; or
c. Inventive representation of the use, name or logo of the structure or business.

3. Architectural Criteria. All signs shall:
a. Utilize and/or enhance the architectural elements of the building; and
b. Be placed in a logical location in relation to the overall composition of the building's façade or the arrangement of the site and not cover any key architectural features/details of the façade/site.
c. No more than twenty-five (25) percent of an architectural element may be used for sign area.

25-021 PROHIBITED SIGNS AND DEVICES

It shall be a violation of these regulations to erect, install, place or maintain the following signs:

a. Any sign which is not otherwise included under types of signs permitted in this Chapter.
b. Any sign located in public right-of-way, except those signs required by governmental authority or political signs as may be permitted.
c. Any sign which, by reason of its size, location, movement, content, coloring, or manner of illumination, may be confused with or construed as a traffic control sign, signal or device, or the light of an emergency vehicle, or which hides from view any traffic or street sign or signal or device.
d. Animated signs or elements of signs, that are animated, moving, flashing, blinking, reflecting, revolving and/or rotating including search lights, strobe lights, and disco balls.
e. Signs emitting audible sounds (except menu boards), odors, or visible matter.
f. Offsite signs and/or billboards.
g. Any sign or advertising structure with words, scenes or graphics which are obscene, indecent and prurient, within the meaning of K.S.A. 21-4301, as amended.
h. Any sign or advertising structure which is erected, installed or maintained that obstructs any fire escape, required exit, window or door opening intended as a means of ingress or egress.
i. Portable signs or signs mounted on a platform, trailer, or motor vehicle. Such prohibition shall not extend to trucks or other legitimate carriers and delivery vehicles that may be parked on said premises in the course of their normal operations.
j. The following signs or sign elements are prohibited unless specifically reviewed and approved by the Planning Commission:
1. Internally illuminated awnings.
2. Changeable copy signs or electronic graphic signs greater than 3 square feet in area.

25-028 – TABLE OF PERMITTED AND SPECIALLY PERMITTED SIGNS

SIGN TYPE	Zoning District																
	Residential										Non-Residential						
	R-R	R-E	R-SF	R-I	R-MF1	R-MF2	R-MF3	R-MHP	PUD-R	HBD	LBD	GBD	PUD-C	I-LT	I-MD	I-H	Sign Standards
Functional Sign Types																	
Attention-Attracting Device or Sign	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Bulletin / Poster Case	C	C	C	C	C	C			C	C	C	C	C				Limited uses, see Section 25-014.
Changeable Copy Signs	C	C	C	C	C	C			C								Limited to public and semi-public uses
Creative Signs	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Directional Sign	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Directory Sign	P	P	P	P	P	P	P		P	P	P	P	P	P	P	P	
Electronic Message Board												P	C	P	P	P	
Flags	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Not exceeding 50 sq. feet
Identification Sign	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	

SIGN TYPE	Zoning District																
	Residential										Non-Residential						
	R-R	R-E	R-SF	R-I	R-MF1	R-MF2	R-MF3	R-MHP	PUD-R	HBD	LBD	GBD	PUD-C	I-LT	I-MD	I-H	Sign Standards
Functional Sign Types																	
Incidental Sign	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Inflatable Sign	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Menu Boards											P	P	P	P			
Multi-tenant (Complex) Signs											P	P	P	P	P	P	
Oversized Wall Signs – Murals	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	
Project Construction Sign	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Residential Subdivision Sign	P	P	P	P	P	P	P	P	P								
Real Estate Sign	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Temporary or Special Event Display Sign	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	Sign Duration Limited by Event
Time and/or Temperature Sign										P	P	P	P	P			
Window Signs	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	

ATTACHMENT "N"

City of Albuquerque/City of Green Bay

(c) The intensity of the LED display shall not exceed the levels specified in the chart below:

INTENSITY LEVEL (NITS)		
COLOR	**DAYTIME**	**NIGHTTIME**
Red Only	3,150	1,125
Green Only	6,300	2,250
Amber Only	4,690	1,675
Full Color	7,000	2,500

Prior to the issuance of a sign permit, the applicant shall provide a written certification from the sign manufacturer that the light intensity has been factory pre-set not to exceed the levels specified in the chart above, and the intensity level is protected from end-user manipulation by password-protected software or other method as deemed appropriate by the Building Safety Director. (4193)

Tucson, AZ:

Prohibited Signs

B. Electronic Message Center: An electronic or electronically controlled message board, where scrolling or moving copy changes are shown on the same message board or any sign which changes the text of its copy electronically or by electronic control more than once per hour.

I. Prohibited advertising display: Notwithstanding any other provision of the Tucson Sign Code, billboards may not change advertising copy by any type of electronic process or by use of vertical or horizontal rotating panels having two or more sides whereby advertising copy is changed by the rotation of one or more panels

Albuquerque, NM.

(D) *Regulations Applicable to Signs in Nonresidential Zones.* The additional provisions of this section apply to all signs not in a residential zone or within 40 feet of a residential zone.

(1) General Illumination.

(a) No light bulb used to indicate time or temperature shall have a rating greater than 40 watts; no reflectors shall be used in connection with such bulbs.

(b) No portion of an illuminated sign, apart from light bulbs used to indicate time or temperature, shall have a luminance greater than 320 footlamberts at night.

(2) Any illuminated sign, or any illuminated element of any sign, may turn on or off, or change its brightness, provided that:

(a) Change of illumination does not produce any apparent motion of the visual image, including but not limited to illusion of moving objects, moving patterns or bands of light, expanding or contracting shapes, or any similar effect of animation except twinkling.

City of Green Bay Digital Billboard Regulations
Proposed Ordinance Text

13-304. Sign definitions. This section defines sign types and sign-related words listed in Chapter 13-2000, Signs. General definitions are listed in Section 13-302. Definitions of land uses listed in this ordinance are listed in Section 13-303.

Changeable copy sign: Any **on-premise** sign or portion thereof with characters, letters, or illustrations that can be changed or rearranged without altering the face or the surface of the sign. Such sign shall not include any sign considered to be an animated sign. A readerboard sign is to be considered a changeable copy sign.

Multiple message sign: A "billboard sign" or "off-premise advertising sign" which automatically changes message or copy electronically or by the movement or rotation of panels or slats. This includes, but is not necessarily limited to, signs known as tri-vision billboards, electronic variable message signs, and digital billboards.

Video Display Sign: (Cr. GO 2-08) A**n on-premise** sign that changes its message or background in a manner or method of display characterized by motion or pictorial imagery, which may or may not include text and depicts action or a special effect to imitate movement; the presentation of pictorials or graphics displayed in a progression of frames, which give the illusion of motion, including, but not limited to, the illusion of moving objects, moving patterns or band of light, or expanding or contracting shapes.

13-2013. Off-premises advertising signs.

(a) Background. In enacting this chapter, special notice has been taken of the often competing viewpoints of citizens and the sign industry, particularly that portion of the industry engaged in billboard operations. Frequently, the citizens' right to an unobstructed view has been pitted against the right of the sign industry and its clients to do business, promoting a "winner takes all" situation in resolving conflicts. This chapter has been designed to protect and accommodate both concerns. In arriving at these compromises, every possible consideration has been afforded the public interest, individual property and business rights, and the need for signs and outdoor advertising. Compromise obviously implies mutual concessions and/or losses. It also suggests mutual gains and benefits. It is further the intent of this chapter that its burdens and benefits be fairly and rationally distributed among all parties involved.

(b) Purpose. This chapter is enacted to provide minimum standards to protect the life, health, safety, property, welfare, convenience, and enjoyment of the general public by regulation and controlling the design, quality of materials, construction, erection, location, electrification, lighting, use, and maintenance of all outdoor advertising signs and sign structures. The purposes of this chapter are to make Green Bay safer by eliminating or reducing safety hazards, to contribute to the development and maintenance of an attractive visual environment while facilitating the communication of messages to the public, and to protect the safety and efficiency of the city's transportation network.

(c) Permitted locations. Off-premises advertising signs shall be permitted only in the following locations, meeting the spacing requirements of this chapter:
   (1) The C1 General Commercial and C2 Highway Commercial Districts.
   (2) The LI Limited Industrial District and the GI General Industrial.

(d) Prohibited locations. Off-premises advertising signs shall be prohibited in the following locations even when located within the permitted zones, as listed in Chapter 13-2013 (c):
   (1) Off-premise signs shall not be located within the front yard setbacks where such setbacks are established.

(2) For purposes of preserving the publicly-adopted redevelopment of the central business district, including significant public pedestrian-scale improvements and amenities, off-premise signs shall not be permitted within the boundaries of the central business district identified on Map "A" or the first parallel public street, whichever is greater. See map at end of chapter.

(3) For purposes of public safety of users of waterways and to provide for the beautification of areas contiguous to various water courses within the city, no off-premise signs shall be located closer than 500' from the waterway shore bank (bulkhead or floodway line) of a river, bay, or waterfront identified on Map "C" or the first parallel public street, whichever is greater. See map at end of chapter.

(4) For purposes of preserving the natural value and views of the many unique historic and natural areas within the city, no off-premise signs shall be located closer than 500' from the established historic districts and natural areas identified on Map "D" or the first parallel public street, whichever is greater. See map at end of chapter.

(e) Exceptions to prohibited locations. The restrictions identified in Chapter 13-2013 (d) shall not apply to the following areas:

(1) Area west of the Fox River to Broadway.

(2) Area immediately adjacent and advertising to West Mason Street (Tilleman Bridge structure).

(3) Area adjacent to and north of the East River, to include both sides of Main Street between the alley west of Webster Avenue easterly to Elizabeth Street.

(4) Off-premise signs may be mounted on or flat against a wall of an intermediate building which prevents said signs from being directed toward said river, bay, historic, or natural area identified in Chapter 13-2013 (d), provided said signs shall be removed if and when said intermediate building is removed.

(f) Existing signs. Existing off-premises advertising signs that do not meet the size and location standards may remain in place and not be considered nonconforming uses. However, a new sign may not be permitted unless it replaces the existing sign that does not meet the size and location standards. All new signs shall meet the requirements of this chapter.

(g) Spacing limitations. Off-premises advertising signs shall maintain the following separation distances:

(1) Off-premise signs shall not be located within fifty (50) feet of residential district boundaries, school property, or public parks and parkways (including those so designated on the Official Map) if said signs are perpendicular to or facing away from such uses. This distance increases to two hundred (200) feet if signs are facing (oriented with message side parallel) said uses. **These distances also increase for multiple message signs per Section 13-2013 (i).**

(2) No sign built within 100 feet of an intersection shall have less than 10 feet of underclearance, unless erected on or against an existing building. Off-premise business signs shall not be located within the front yard setbacks where such setbacks are established.

(3) A minimum of three hundred fifty (350) feet between off-premise signs, as viewed from any main travel direction of the same street, and in the same direction, except for signs adjacent to freeways and expressways. Spacing shall be measured in a lineal direction on the same side of the street. "Back-to-back" mounting of such signs is acceptable, as are signs mounted on or flat against opposite parallel walls of a building.

a. Off-premise signs adjacent to freeways and expressways shall be spaced a minimum of seven hundred fifty (750) feet apart, measured in a lineal direction on the same side of the freeway or expressway.

(h) General requirements.

(1) Off-premise signs shall be considered a principal use of the property on which they are located and shall not project over the right-of-way.

(2) No more than two off-premise signs are permitted on the same zoning lot. Furthermore, such off-premise signs shall be limited to one sign for each of two approach directions of traffic.

(3) Signs shall not exceed seven hundred (700) sq. ft. in total area per sign face or 300 sq. ft. if applied directly to walls.

(4) Signs shall not exceed thirty (30) feet in height. Sign height shall be measured from average height at road grade elevation to the highest point of the sign.

(i) Multiple message sign operation. Multiple message signs are permitted as a conditional use. To be considered for a conditional use permit, such signs must meet all regulations of this chapter and the following:

(1) Standards for multiple message signs

a. The ~~louver rotation~~**transition** time**, or the time it takes** to change **the** message **(electronically, via louver rotation, or other means),** shall be one second or less.

b. The time the message remains in a fixed position shall be ~~six~~ **eight** seconds or more, **and movement or animation is prohibited** ~~both pursuant to Wis. Trans. 201.15(4). If such operation malfunctions, sign is to stop rotation and remain in a stationary position~~.

c. Audio speakers and all forms of pyrotechnics are prohibited.

Reduce this to add to sign code.

d. Electronic multiple message signs (digital billboards) shall be equipped with automatic dimming capability, and light produced by such signs shall not exceed 0.3 foot candles over ambient light levels. The ambient light reading is taken at least 30 minutes past sunset with the sign turned off or displaying all black copy. The fully lit reading is taken with the sign displaying all white copy. Measurement of light levels should be taken perpendicular to the face of the sign, and the following distances should be used as guidelines to determine where to take measurements:

i. 100 square foot or smaller sign to be measured 100 feet from source

ii. Greater than 100 to 350 square foot sign to be measured 150 feet from source

iii. Greater than 350 to 650 square foot sign to be measured 200 feet from source

iv. Greater than 650 to 700 square foot sign to be measured 250 feet from source

e. Spill-over light exceeding 0.2 foot candles as measured at a residential property line is prohibited.

(2) Mitigation of multiple message signs. Since the maximum number of off-premise signs permitted in the City is fixed at the number in the current sign inventory, and because multiple message signs can display multiple messages, a new multiple message sign (whether new construction or sign replacement) shall be mitigated. In addition to meeting the requirements of subpar. (j), a new multiple message sign must earn at least 5 mitigation points per sign face. One or more existing billboards will be removed as part of the mitigation process.~~One mutually agreed to existing billboard will be removed from a location with equal to or greater traffic volumes for each tri-vision sign conditionally approved.~~

a. Mitigation points can be earned in the following ways. Note that points are assessed and required per sign face.

i. Five (5) points per sign face for the removal of a billboard that is nonconforming due to location in the CBD, a natural area, or a historic district

ii. Four (4) points per sign face for the removal of any other nonconforming billboard

iii. Three (3) points per sign face for the removal of a conforming billboard that is capable in its existing structural condition of safely supporting a multiple message sign of the same area as the existing sign face

iv. **Two (2) points per sign face for the removal of any other existing billboard that is not capable in its existing structural condition of safely supporting a multiple message sign of the same area as the existing sign face**

v. **One (1) additional point per sign face for the removal of a billboard visible from a street or highway with a functional classification of Interstate, Freeway, or Principal Arterial**

vi. **No points are awarded for the replacement of an existing billboard (While a digital billboard may be approved where an existing static sign has been removed from a conforming location, this sign removal does not count toward the required mitigation points. The points must be obtained from other sign sites.)**

b. **A mitigation plan shall be submitted for review by the Planning Department, and more than one new multiple message sign may be included in a single mitigation plan. The cumulative points earned for sign removal may be applied to multiple signs within a single mitigation plan and sign permit application. However, any excess points remaining are not carried over or "banked" for future applications. In other words, mitigation points will not be tracked beyond a single sign project which may involve multiple new signs. The reason for this is to avoid conflicts between mitigation points and the existing cap on the total number of allowable off-premise signs.**

c. **If the cumulative result of a sign project and mitigation plan is a net reduction in signs, then the maximum allowable number of off-premise signs for the City as a whole will be reduced immediately. This means that signs removed under a mitigation plan can only be replaced with the multiple message sign(s) being mitigated. They cannot be replaced with other signs in the future.**

(3) Permitted locations of multiple message signs

a. Sign message must be directed to a state or federal highway, **or a designated connecting highway, as mapped by the Wisconsin Department of Transportation in accordance with Ch. 84.02(12), Wis. Stats.**

b. Signs **with a variable message face visible to drivers approaching an intersection where drivers must also watch for cross traffic, bikes, and/or pedestrians** must ~~be located at least 500 feet~~**comply with the following setbacks** from ~~any street~~**that** intersection **as measured from the street right-of-way line** ~~where drivers must also watch for cross traffic, bikes, and/or pedestrians~~.

i. **100 square foot or smaller sign to be set back at least 100 feet**

ii. **Greater than 100 to 350 square foot sign to be set back at least 150 feet**

iii. **Greater than 350 to 650 square foot sign to be set back at least 200 feet**

iv. **Greater than 650 to 700 square foot sign to be set back at least 500 feet**

c. **Such signs shall not be located within one hundred (100) feet of residential district boundaries, school property, or public parks and parkways (including those so designated on the Official Map) if said signs are perpendicular to or facing away from such uses. This distance increases to four hundred (400) feet if signs are facing (oriented with message side parallel) said uses.**

(4) Hazard abatement.

a. **If the Director of Public Works or his/her designee finds that an electronic multiple message sign (digital billboard) is causing interference with the visibility or effectiveness of a traffic signal or control, the sign shall be turned off without delay.**

b. **If the Director of Public Works or his/her designee finds that an electronic multiple message sign (digital billboard) is malfunctioning in a fashion that creates a hazardous glare or other traffic hazard, the sign shall be turned off without delay.**

c. In such a situation, the owner of the sign must then meet with City staff to determine how to rectify the situation, and the sign shall not be turned back on without City staff approval.

d. Each sign owner is to maintain up-to-date contact information with the Department of Public Works for such purposes. The contact information is to provide 24-7 (24 hour per day, 7 days per week) access to a person or persons that is/are available at all times to respond to a hazardous sign situation.

(5) Standard conditions of approval. The following are the minimum conditions of approval that shall be applied to the conditional use permit. Other appropriate conditions of approval may also be required by the Plan Commission and City Council.

a. A site plan and applicable permit applications (sign permit, electrical permit, building permit) shall be required for erecting a new multiple message sign or for converting an existing static display sign to a multiple message sign.

b. The sign permit application shall not be valid unless approved by the Traffic Engineer.

c. A mitigation plan shall be submitted for review and approval by the Planning Department.

d. If the US Department of Transportation, Federal Highway Administration concludes before June 1, 2010 that digital billboards or their particular operation are detrimental to traffic safety, then the hazard posed by this sign shall be resolved. If the hazard can be effectively resolved by adjusting the brightness, length of display, or other such performance issue, then this shall be allowed as the course of action. If the hazard cannot be effectively resolved by adjusting the performance of the sign, then the sign shall be removed and may be replaced with an approvable sign.

e. **The Department of Public Works shall be provided with the means to turn off a digital billboard in the case of hazardous glare, interference with the visibility or effectiveness of a traffic signal or control, or other traffic hazard caused by the sign.**

(j) Inventory of off-premise signs. The inventory of all existing and permitted off-premise signs and sign sites shall be the number of signs and sign sites then legally permitted or in existence as of August 19, 1986, **or as updated under this section,** and shall represent the maximum number of off-premise signs and sign sites permitted within the City of Green Bay.

(1) All off-premise signs and sign sites authorized as of August 19, 1986, but not constructed as of August 19, 1987, shall be removed from the inventory of off-premise outdoor advertising signs and shall correspondingly reduce the number of signs permitted within the City of Green Bay.

(2) Any sign removed after August 19, 1986, which is not replaced in compliance with this ordinance or any sign ordered to be removed by order of a court of competent jurisdiction after August 19, 1986, shall be removed from the inventory and correspondingly reduce the number of signs and sign sites permitted within the City of Green Bay. **Based on an updated inventory as of March 1, 2009, the maximum number of signs and sign sites permitted was 85.**

(3) Any replacement sign, pursuant to this subsection, shall comply with all applicable ordinances for the location and construction of said sign.

a. Any sign(s) removed pursuant to this subsection may be replaced by a sign that does not exceed the cumulative square footage of the sign(s) that it is replacing.

b. Any sign replaced shall be reconstructed within one year after the issuance of the wrecking permit for the sign(s) that it is replacing.

c. In no event shall the replacement of a sign(s) result in more sign site(s) than the number of sign sites identified in the inventory of August 19, 1986, **or as updated under this section.**

(4) Any sign acquired by the City of Green Bay or any other governmental authority may be replaced by the sign owner within one year after the date that the City acquires the sign.
   a. For purposes of this subsection, the date of acquisition in condemnation cases shall be the date on which the jurisdictional offer is issued for the acquisition of that sign.
   b. In all other cases, the date of acquisition shall be the date on which the property owner accepts the government body's offer to purchase such sign.
   c. No sign shall be replaced pursuant to this subsection unless the owner has complied with all applicable ordinances for the location and construction of said sign.

(k) Application for a permit. The application for off-premise sign permits shall contain all information, drawings, and specifications necessary to fully advise the Inspection Department of the City of Green Bay of the type, size, shape, location, zone, construction, and materials of the proposed sign and the building structure or premises upon which it is to be placed. No building permit shall be issued for a replacement sign until all conditions of the wrecking permit have been fully complied with.

(l) Additional information needed. When applying for a billboard permit, the billboard operator/owner shall, in addition to the above, furnish the following information at the time of permit application:
   (1) The location of the proposed sign in relation to the property lines and any building, fence, or other structure on the property on a site plan.
   (2) The location of the proposed sign in relation to the property lines and any building, fence, or other structure on the property on a site plan.
   (3) The distance to the nearest off-premise outdoor advertising sign.
   (4) An affidavit from the property owner authorizing erection of the sign or an executed lease agreement without disclosing the terms of the lease or the lease rent.
   (5) A professional engineer's certificate.

ATTACHMENT "O"

Draft CLC Sign Code Regulations

this subsection be construed to prevent the changing of the message of a sign.

(d) *Repair, alteration or removal.* Any written notice to repair, alter or to remove a sign will be sent via certified mail by the sign administrator to the land owner and to the sign owner lessee, or person(s) responsible for the sign. If such order is not acted on within seven days, the sign administrator may initiate proceedings contained in this chapter to revoke the permit and remove the sign at the expense of the land owner, sign owner, lessee, or person(s) responsible for the sign.

(e) *Unlawful signs.* If any sign is installed, erected, constructed or maintained in violation of any of the terms of this chapter, or the applicable code the sign was erected under, the city may issue a written warning to the sign owner, lessee, property manager or landowner. This warning shall outline the violation and order the designated responsible party to bring the sign into compliance with this chapter and any other applicable codes within 14 days from the date of the warning. Only one warning per violation will be issued. The warning shall remain in effect for the duration of the business.
(Ord. No. 1128, § I.4, 5-18-90)

Deleted: (e)

Sec. 36-8. Nonconforming signs.

(a) Subject to the remaining restrictions of this section, nonconforming signs that were otherwise lawful on the effective date of the ordinance from which this chapter derives may be continued.

(b) No person may engage in any activity that causes an increase in the extent of nonconformity of a nonconforming sign. Without limiting the generality of this statement, no nonconforming sign may be enlarged or altered in such a manner as to aggravate the nonconforming condition, nor may illumination be added to any nonconforming sign.

(c) Any change in the use of any building or property on which a nonconforming sign is located will require that all nonconforming signs on that property be brought into compliance with all applicable sections of this chapter within nine months of the change.

(d) A nonconforming billboard may be reconstructed on the same property so as to meet the size, height, configuration, **and** support requirements of this code without losing its legal nonconforming status. To the extent possible, setback and separation requirements will be met. A non-conforming billboard being converted into an electronic variable message display sign shall come into **full compliance** with all off-premise electronic variable message display billboard provisions. A sign permit is required in order to rebuild a nonconforming sign under this provision.

(e) A nonconforming on premise sign may not be moved or replaced except to bring the sign into conformity with this chapter to the extent possible. For the purpose of this subsection, the term "replaced" means the replacing of any or all parts of a sign

that would extend the normal life span of the sign. An example is replacing wood pole supports with metal I-beam supports.

(f) If a nonconforming sign is destroyed, damaged or in need of repair, it may not thereafter be repaired, reconstructed or replaced except in conformity with all the sections of this chapter and the remnants of the former sign structure shall be cleared from the land. For purposes of this subsection, a nonconforming sign is destroyed, damaged or in need of repair if damaged up to 50 percent of the cost of repairing the sign to its former stature or if the cost of replacing it equals or exceeds the tax value (tax value if listed for tax purposes)/sign valuation (as stated on the original permit) of the sign so damaged, whichever is less.

(g) The message of a nonconforming sign may be changed so long as this does not create any new nonconforming issues (for example, by creating an off-premises sign under circumstances where such a sign would not be allowed).

(h) If a nonconforming sign other than a billboard advertises a business, service, commodity, accommodation, attraction or other enterprise or activity that is no longer operating or being offered or conducted, that sign shall be considered abandoned and shall be removed within 90 days after such abandonment by the sign owner, owner of the property where the sign is located or other party having control over such sign.

(i) If a nonconforming billboard remains blank for a continuous period of 90 days, that billboard shall be deemed abandoned and shall be altered to comply with this chapter or be removed by the sign owner, owner of the property where the sign is located or other person having control over such sign. For purposes of this subsection, a sign is blank if:

(1) It advertises a business, service, commodity, accommodation, attraction or other enterprise or activity that is no longer operating or being offered or conducted;

(2) The advertising message it displays becomes illegible in whole or substantial part; or

(3) The advertising copy has been removed.

(j) The city shall reserve the right to remove a nonconforming sign in accordance with state law.

(k) This section shall not apply to any benches placed under the terms of any contract in effect on the date effective date of the ordinance from which this chapter derives.

(Ord. No. 1128, § I.5, 5-18-90; Ord. No. 1509, 2-5-96)

ARTICLE II.
ON-PREMISES SIGNS*

* **Cross References:** Licenses, taxation and miscellaneous business regulations, ch. 16.

Sec. 36-41. General conditions.
The following general conditions apply to on-premises signs:

(1) *Accessory use sign.*

a. The primary purpose of the sign must be corporate/business identification and not advertising per se.

b. The object into which the sign is incorporated must serve a functional purpose and be an item which is normally associated with the type of business or enterprise for which it is being used.

(2) *Attached sign.* No attached sign shall extend beyond the highest point of a roofline, or project beyond the edge of any wall.

(3) *Decorations.* Any display shall be removed no later than five days after the event/holiday.

(4) *Development identification sign (permanent.).*

a. The maximum sign area shall not exceed 32 square feet.

b. The maximum height shall not exceed ten feet.

c. The sign may be placed in the public right-of-way, provided prior approval has been granted by city manager or designee.

d. This sign may be used in addition to any other freestanding sign allowed pursuant to this chapter.

(5) *Directional sign.* Directional signs visible from the public right-of-way (i.e., entrance/exit) shall not exceed six square feet in sign area and four feet in height.

(6) Electronic variable message display sign

(a) On-premise electronic variable message display signs are only permitted along a collector or higher category of street classification based upon the Las Cruces Metropolitan Planning Organization designation.

(b) A maximum of one (1) attached on-premise electronic variable message display sign is permitted per property. One (1) on-premise electronic variable message display sign is permitted on each side of a freestanding sign provided that the sides of the sign are parallel to each other or at no more than a 45 degree angle. Any freestanding sign with more than a 45 degree angle shall only be allowed a total of one (1) electronic variable message display sign.

(c) No on-premise electronic variable message display sign shall be located on the same property as an off-premise electronic variable message display billboard.

(d) Animated messages are not permitted. Scrolling or traveling signs are permitted, provided that they do not exceed two lines.

(e) On-premise electronic variable message display signs that are static shall not contain flashing lights as part of the display.

(f) Static messages on an on-premise electronic variable message display sign shall be displayed for a minimum of eight (8) seconds and a change of message shall be accomplished instantly with no transition between messages.

(g) Static messages on an on-premise electronic variable message display sign shall occur simultaneously all at once on the entire sign face.

(h) An on-premise electronic variable message display sign shall have an automatic dimmer control to produce distinct illumination change from the highest allowed illumination level to the lowest level meeting the illumination standards of the City of Las Cruces Outdoor Lighting Ordinance, Chapter 39 of the City of Las Cruces Municipal Code. A default mechanism must be installed that shall freeze the sign in one position or static message if a malfunction occurs.

(7) *Flags.*

a. Displays incorporating the identification of a nation, state or corporation shall follow accepted flag protocol. Only one corporate flag will be allowed per lot.

b. Displays used to serve as decoration, exclusive of decorations used in fiestas, communitywide festivals or national holidays, shall have

Sec. 36-83. Billboards.

_____(a) Billboards shall be located only in areas zoned C-2, C-3, M-1/M-2, or M-3.

_____(b) Billboards may be located only along the following roadways and only along street segments having a minimum of 75 percent office, commercial or industrial zoning. (A street segment is defined as that length of a roadway located between intersections of two collector or higher classified roadways.)

Interstate 10	Interstate 25
Bataan Memorial East and West (west of Porter Drive)	
Main Street	Picacho Avenue
Amador Avenue	Lohman Avenue (west of Interstate 25)
Solano Drive	El Paseo Road
Valley Drive	Motel Blvd (south of Picacho)
Telshor Blvd (north of Lohman)	

_____(c) Total sign area, spacing, height and setbacks shall be subject to the following requirements:

_____(1) Billboards located along interstate highways shall not exceed 400 _____square feet of total sign area, shall be spaced a minimum of 1,000 _____feet away from any other billboard and shall not exceed 40 feet in _____height measured from ground level.

_____(2) All other billboards shall not exceed 300 square feet of total sign _____area, shall be spaced a minimum of 1,000 feet away from any other _____billboard and shall not exceed 30 feet in height measured from _____ground level. There shall be a minimum clearance of 15 feet _____measured from the ground level to the bottom of the billboard face.

_____(3) A maximum of two faces, parallel back-to-back is permitted, _____provided both faces are of the same size and attached to the same _____pole for support. Sign faces must be relatively perpendicular to the _____designated roadway and each face shall not advertise more than _____one message.

_____(4) Billboards shall be supported by a maximum of two upright poles.

_____(5) Vertical or horizontal stacking of billboards is prohibited.

_____(6) Billboards shall be set back a minimum of 15 feet from the _____property line fronting along the designated roadway. Except for _____billboards fronting along interstate highways, the setback from the _____designated roadway shall not exceed one third of the property

ARTICLE III.

OFF-PREMISES SIGNS

Sec. 36-81. Attached signs.
No attached off-premises signs shall be permitted.
(Ord. No. 1128, § D.1, 5-18-90)

Sec. 36-82. Public area signs.

(a) With the approval of the city manager, bus benches and bus shelters may be placed in the public right-of-way along bus routes or in areas frequented by pedestrians. In addition, signs may be placed on benches and shelters and in landscaped medians, parks, trails, and arroyos that are adopted public areas.

(b) No commercial (other than a business name as specified in (c) below) or political advertising shall be placed upon bus benches, bus shelters, or in other public areas.

(c) Benches, shelters, and medians donated or maintained by individuals or businesses may have signs designed by the city with the inscription "adopted by..." and further regulated by:

_____(1) The sign on benches shall be no larger than three inches high by _____18 inches long.

_____(2) The sign on shelters shall be no larger than 12 inches high by 48 _____inches long.

_____(3) The sign in medians shall be no larger than 12 inches high by 18 _____inches long.

_____(4) The sign in parks, trails, and arroyos shall be no larger than 18 _____inches high by 24 inches wide.

(d) Bus benches are exempt from the location restrictions for freestanding signs only when they are located at designated bus stops.

(e) This section shall not apply to any benches placed under the terms of any contract in effect on the effective date of the ordinance from which this chapter derives.
(Ord. No. 1128, § D.2, 5-18-90; Ord. No. 2141, § I, 10-4-04)

depth. In each case there shall be a minimum of five feet from all other property lines measured from the property line to any portion of the billboard structure.

(7) Billboards shall have a minimum sign area of 72 square feet.

(d) A legally permitted billboard which follows all associated standards for billboards is allowed to advertise a business, product, service, or activity that is located on the same premises.

(e) Electronic variable message display billboards:

(1) Electronic variable message display billboards shall be separated a minimum distance of one thousand (1,000) feet from any other electronic variable message display billboard.

(2) No off-premise electronic variable message display billboard shall be located on the same property as an on-premise electronic variable message display sign.

(3) Off-premise electronic variable message display billboards are limited to static messages of display. No scrolling, traveling, animated, or moving messages are allowed. Public information such as current temperatures, climate, and time are permitted.

(4) One (1) off-premise electronic variable message display is permitted on each side of a billboard.

(5) Each message on an off-premise electronic variable message display billboard shall be displayed for a minimum of eight (8) seconds and a change of message shall be accomplished instantly with no transition between messages. Only one (1) message per side is allowed at any given time.

(6) A change of message on an off-premise electronic variable message display billboard shall occur simultaneously all at once on the entire face.

(7) The owner of an off-premise electronic variable message display billboard shall provide access to the sign to the governing body for the purpose of announcing critical public information such as Amber Alerts, and major emergencies when needed.

(8) An off-premise electronic variable message display billboard shall have an automatic dimmer control to produce distinct illumination change from the highest allowed illumination level to the lowest

level meeting the illumination standards of the City of Las Cruces Outdoor Lighting Ordinance, Chapter 39 of the City of Las Cruces Municipal Code. A default mechanism must also be installed that shall freeze the sign in one position or static message if a malfunction occurs.

(Ord. No. 1128, § D.3, 5-18-90)

Sec. 36-84. Garage, private sale or event signs.

(a) Off-premises signs may be used to advertise any garage sale, private sale or event, provided that the signs are not over three square feet in sign area and are used only during the duration of the event.

(b) The person erecting the sign and the property owner at the sign location shall be responsible for sign removal and all other requirements concerning signs.
(Ord. No. 1128, § D.4, 5-18-90)

Sec. 36-85. Government signs.

(a) Traffic control and similar signs are exempt from all requirements of this chapter.

(b) Building identification signs and similar signs do not require permits; however, they must meet the numerical requirements of this chapter.
(Ord. No. 1128, § D.5, 5-18-90)

Sec. 36-86. Political signs.

(a) No individual political sign shall exceed 32 square feet in sign area.

(b) All political signs may be erected no sooner than 90 days before the election and/or caucus to which they pertain and shall be removed within ten days following the same election and/or caucus.

(c) Advertising on a duly permitted billboard shall be exempt from the size and time limits stated in this section.

(d) Political signs are permitted to be placed on fences/walls (e.g. chain link fences, retaining walls, rock walls), but are not permitted to be placed in clear sight triangles or in a manner that would prevent clear sight of vehicles (See section 32-405 of the Municipal Code).
(Ord. No. 1128, § D.6, 5-18-90; Ord. No. 2111, §§ I, II, 6-21-04)

Sec. 36-87. Vehicle signs.

Off-premises vehicle signs are permitted provided the vehicle is: