

Research on Electronic and Moving Image Signs and Other Signs Intended to Attract Attention

By Michelle Aniol

Signs are a Source of Driver Distraction. The intent of a sign is to attract attention of passersby (on foot or some motorized form of transportation) for the purpose of conveying a message. Thus, by their very nature, signs distract drivers from the activity of driving. Two studies¹ regarding the role that traditional static advertizing has on driver distraction “found a strong correlation between the number of billboards and crash rates.”

Two more recent studies, which compared driver behavior in response to passive (static) and active (electronic) signs and the relationship between electronic signs with moving/flashing images and driver distraction, “found that about twice as many glances were made toward active signs than the passive signs”² and “electronic signs with moving images contribute to driver distraction for longer intervals than electronic signs with no movement.”³

Of particular concern is the *Zeigarnik effect*⁴ from signs (at right) that contain a visual story or message for two or more frames because drivers tend to focus on the message until it is completed. The loss of attention could result in an unconscious slowing of speed, drifting into another lane of traffic, and overall unsafe driving behaviors.⁵

The National Highway Traffic Safety Administration commissioned a study that examined the cause of vehicle crashes.⁶ The study found that driver inattention contributed to 22.7% of crashes compared to 18.7 for speeding and 18.2 due to alcohol impairment.



¹ Federal Highway Administration, Reanalysis of Faustman Field Study (1973) and Federal Highway Administration, Reanalysis of Faustman Field Study (1973).

² University of Toronto, *Observed Driver Glance Behavior at Roadside Advertizing Signs* (Beijer & Smiley 2004)

³ City of Seattle Report (Wachtel, 2001).

⁴ *Zeigarnik effect* describes the psychological need to follow a task through to its completion.

⁵ (Wachtel, 2001).

⁶ National Highway Traffic Safety Administration/Virginia Tech Transportation Institute, *Driver Inattention is a Major Factor in Serious Traffic Crashes* (2001).

Two separate but similar studies, one conducted by the NHTSA⁷ and the other by the University of North Carolina Highway Safety Research Center⁸ determined that the greatest source of driver distraction was due to a specific person, object or event outside the vehicle.

Illumination and Brightness are another Issue. How brightly a sign is illuminated is another area for concern because an overly lighted sign has the potential to cause problems for a driver, regardless of whether the sign is static or has movement.

Disability glare occurs when a driver is exposed to a light source that is so bright it temporarily blinds the driver and impairs the driver's ability to perform the task at hand, whereas **discomfort glare** occurs when a light source is bright enough to distract or causes the driver to look away from the light but doesn't cause temporary blindness.⁹

Establishing standards for illumination and brightness, such as reducing/minimizing glare and maintaining contrast during the day, and requiring automatic dimming to control brightness at night, reduces driver distraction, as well as light trespass into residential areas.

Based on research of reports and compilation of findings and regulations from other communities across the country, the following comments are offered for the City's consideration:

- A. Electronic Display Signs.** Concerns that LED (light emitting diode) signs have the potential to distract drivers and cause potential traffic accidents have resulted in numerous studies and prompted legislative bodies to adopt (sometimes hastily) ordinances that prohibit or severely limit the installation of LED signs.

One of the most cited studies to date was conducted for the City of Minnetonka, Minnesota in 2007.¹⁰ The primary concern that precipitated the study centered on LED billboards. However, the study examined the issue in broader terms of dynamic (i.e. electronic) display signage, which was "defined as any characteristic of a sign that appears to have movement or that appears to change," which is "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." Movement or change may include rotating, revolving, moving, flashing, blinking or animated display and any other display that incorporates rotating panels of LED lights, which are manipulated through digital input or other method or technology to allow the sign face to present a series of images or displays.

1. Regulatory Relief. The following seven keys provide the basis for regulating electronic signs:
 - a. Appropriate duration of the electronic sign message: Establishing the duration between messages is accomplished by calculating the length of time a sign is visible based on a driver's speed, speed limits, and traffic volume. The following table identifies the number of new messages that can be seen at various driver speeds and the time interval between messages:

⁷ Association for the Advancement of Automotive Medicine, The Role of Driver Inattention in Crashes; New Statistics from the 1995 Crashworthiness Data System (Wang, 1996).

⁸ *The Role of Driver Distraction in Traffic Crashes* (Stutts et al., 2001)

⁹ SRF Consulting Group, Inc., 2007.

¹⁰ "Dynamic" Signage: Research Related to Driver Distraction and Ordinance Recommendations, SRF Consulting Group, Inc., (2007).

Number of Messages Seen							
Speed (mph)	Time sign is clearly visible* (seconds)	Message Display Time (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

Source: SRF Consulting Group, Inc., (2007)

*Assuming the sign is clearly visible from ½ mile away.

The majority of the City's roads that front parcels which are zoned commercial or industrial zoning fall into one of the three speed categories listed above, with the exception of the I-75 Expressway. Two messages in a 60 second interval seems appropriate when compared to 11 messages in a 6 second interval on a road with a speed limit of 30 mph or 8 messages at 45 mph or 7 messages at 55 mph; especially considering that when the number of message changes is limited, the potential for driver distraction is reduced. However, it also lessens the opportunity of the business owner to communicate information. Thus, we recommend the duration for an electronic message be no less than 10 seconds.

To further reduce the distraction associated with a driver watching an electronic sign change its message (i.e. the *Zeigarnik effect*); we recommend prohibiting flashing, spinning, revolving transition methods between electronic display messages, and prohibiting electronic signs that require or induce a driver to watch a sign for several seconds, such as video display signs.

- b. Determine whether to permit motion, animation, and video messages, and if so, under what conditions: Since video signs and signs with scrolling text and moving and flashing images contribute to greater driver distraction and take more time to read and comprehend than electronic signs without movement or flashing images, we have developed provisions that prohibit video signs, as well as signs with scrolling text and moving and flashing images.
- c. Appropriate level of brightness and illumination: Regulating brightness can be challenging. However, we have developed provisions that require glare to be reduced/minimized to maintain an appropriate level of contrast during the day, and we recommend that an automatic dimmer be incorporated into the sign to control brightness at night, reduce driver distraction and light trespass into residential areas.

Illumination can be regulated by requiring the submittal of a photometric plan that shows the proposed illumination levels (in foot-candles) do not exceed 0.5 foot-candles at the property line, when measured five feet from the ground.

- d. Appropriate placement and spacing of signs: Studies have shown that more advertising signs along a road section contribute to a higher rate of traffic accidents, as do intersections that contain advertising signs. The Ordinance contains provisions that 1) regulate the minimum lot width (i.e. frontage on a road) per zoning district, 2) require signs to be setback from the road right-of-way, and 3) prohibit signs within the clear vision area at the intersection of two roads or the intersection of a driveway and a road.

- e. Treatment of on-site and off-site electronic signs: The Ordinance contains a definition for on-site and off-site signs, regardless of whether they are electronic or static. In addition, we have developed provisions that specify that on-site signs and off-site signs (i.e. billboards) with video displays are prohibited. Thus, parity is maintained.

- f. Appropriate size of electronic signs: There is no standard approach to regulating the area of a sign face for electronic display. With electronic display prohibited on off-premise signs, the focus on size is centered on those types of signs in which electronic display would be permitted, such as freestanding and marquee signs.



It is common knowledge in the sign industry that businesses tend to use frequent message changes when the area for electronic display is too small. The area of the sign face for electronic display should be sufficient to allow the message to be visible for the motoring public. We recommend the percentage of the sign face area not to exceed 60% for electronic messages, and by limiting the number of lines of text to not more than two, we can ensure that the size of the text will be clearly visible from the road.

- g. Appropriate text size for electronic signs: Legibility of a sign is important for all parties involved. For highway signage a ratio of 1:30 is preferred, which means that 1 inch of text is visible from 30 feet away. Thus, larger text is required for signs to be legible from greater distances. While large text allows a driver to read a sign from varying distances and still remain on task (i.e. focus on driving), communities are loath to allow oversized signs that would compromise the aesthetic character of their community, but moreover, result in even greater driver distraction. In addition, regulating text size or the type of text or the amount of text is rarely regulated. We are not recommending provisions that regulate text size for electronic signs; however, we are confident that limiting the number of lines of text on an electronic display sign (as cited above) will provide sufficient area to communicate a businesses message(s) and still retain high visibility for a driver while also reducing driver distraction.

- 2. Time and Temperature: Restrictions on duration of electronic display messages are not appropriate for electronic signs that display time and temperature because it is generally accepted that time and temperature information must be accurate. Therefore, the number of times the message for time and temperature may change may be more frequent than for commercial business messages.

B. Temporary Promotional Signs. Temporary promotional signage can include such devices as, balloons (regardless of the size), inflatables, and search lights. Businesses often use these types of signs to announce or advertise a special event, sale or promotion for a limited period of time. The City currently prohibits temporary promotional signs for commercial uses, opting instead to allow non-commercial signage for events that have a community wide, non-commercial focus or holiday theme. This was done for a number of reasons, but primarily because of concern that temporary promotional signs have the potential to distract drivers and impact safety, as well as negatively impact the aesthetic character and quality of the City.

1. Balloons and Inflatables:

- a. *Balloons* are devices, regardless of their size, which are designed to advertise a business location, sale or other special event. Traditional balloons, as shown to the right, are generally helium filled, group together, and then fastened to a support or structure. They may be one or many colors.

- b. *Inflatables*, as shown to the right, are constructed of a flexible fabric material that achieves its shape when air or other gas is inserted. Inflatables must be securely fastened to the ground or a sturdy structure (i.e. a building rooftop) in order to ensure minimal movement of the device.

Other inflatable devices include such things as air dancers, sky dancers, air tubes, air puppets, and other similar types of inflatable devices, which are designed to move fluidly as a high output fan rushes air up through the flexible material.

The Zoning Ordinance currently prohibits such temporary commercial promotional advertising. We are recommending the Planning Commission consider allowing the limited use of temporary promotional signs by commercial and industrial enterprises, subject to an application and permit process, as well as limiting the number of times per week and per year that balloons and inflatables could be used for promotional advertising.



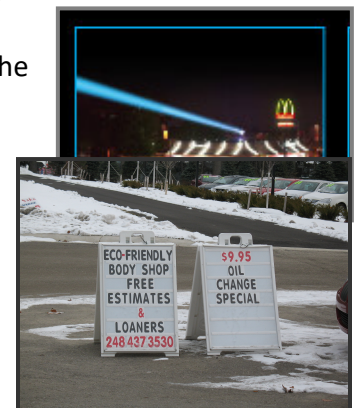
2. Searchlights: Searchlights are designed to draw attention and highlight a business' event/location where localized "beyond the line of sight exposure." Searchlights are designed to operate in a stationary position or as a full motion sweeping light source.

We are recommending that the City consider requiring a permit for searchlights, as well as limiting the number of times per week, per month, and per year that searchlights could be used for promotional advertising.

- C. **Sandwich Board Signs.** Sandwich boards gained popularity in the 19th century before we became a vehicle-oriented society. Sandwich boards consist of two sign faces with text or graphic or combination of both, which are hinged at the top. These signs are generally most effective when displayed in pedestrian areas to identify or advertise a place of business or promotional event within easy walking distance.

Typically, an A-frame design, sandwich boards may be factory imprinted, handwritten or manual changeable copy. In addition to the A-frame style, the T-frame sandwich board is another example of a sandwich board sign.

We recommend amendments to allow the placement of sandwich boards outside the road right-of-way by businesses in the Central Business and Neighborhood Business districts, but only during businesses hours.



- D. **Human Signs.** A human sign is one that is worn (including costumes) or held by a human for commercial advertising or promotion purposes. It must be noted that regulating portable signs worn by a person (i.e. "human sign") may have constitutional issues (*Ballen v. Redmond*, 466 F.3d 736 (9th Cir., 2006), and *Kitsap County v. Mattress Outlet*, 145 Wn.2d 506 (2006)). A judge in the 44th District Court of Royal Oak, Michigan upheld the issuance of a ticket to a business owner who was cited for violating the portable sign provision of Royal Oak's sign ordinance.



The City Attorney recommended, in a written opinion, dated April 6, 2009, that the City allow signs worn by humans, as long as they do not present a traffic safety concern. He based his recommendation on a four-pronged test establish in City of Rochester Hills v. Schultz, 459 Mich. 486 (1999) and the validity of restraining commercial speech.