



Digital Sign Considerations for Roadways

Definitions

Digital signs – electronic screens with light emitting diodes (LED) that display computer-programmed content called sign copy. The sign copy can be programmed to change at different intervals and the screen brightness is adjustable according to time of day or night or ambient light conditions.

Highway – includes a common and public highway, street, avenue, parkway, driveway, square, place, bridge, viaduct or trestle, any part of which is intended for or used by the public for the passage of vehicles and includes the area between the lateral property lines thereof.

Legibility – the physical attributes of a sign that allow for differentiation of its letters, words, numbers, or graphics and that directly relate to an observer's visual acuity. Legibility is considered an objective stimulus.

Maximum luminance – the amount of light leaving the source i.e., emitted by the light source measured in candelas per square metre (cd/m²) or nits (1 nit = 1 candela per square metre).

Maximum illuminance – the amount of light falling on a surface such as the ground, measured in foot-candles or lux (1 foot-candle = 10.7 lux, 1 lux = 0.09 foot-candles).

Readability – the character of a sign that leads to comprehension of its intended message and depends on legibility and other considerations of content and time restraints. It is considered a subjective outcome. Readability enables the observer to correctly perceive the information content of letters, numbers or symbols grouped together in words, sentences, or other meaningful relationships on the sign.

Distracting Effects of Digital Signs

There have been changeable message signs on our highways for many years. MTO has used permanent overhead changeable message signs on 400 series highways extensively to warn of road conditions ahead such as a lane closure or to remind us to buckle up. Portable changeable message signs are used in construction zones to warn of reduced speed limits or detours ahead.

The digital signs appearing on highways today go far beyond the capabilities of changeable message signs. There are primarily two types of digital signs, first party signs used by business and industry for their own messages and third-party signs used for commercial advertising. We should not forget that advertising is a form of expression that is protected by the Canadian Charter of Rights and Freedoms,

but it is a non-essential type of roadside information as it relates to the driving task and it inherently increases collision risk by distracting drivers. Jurisdictions must balance the freedom to advertise with the potential increase in crashes¹.

The ability to quickly and easily change the sign copy or sign messaging on digital signs offers the opportunity for municipalities to use a portion of the screen time to deliver public information such as emergency messages or provide warnings of changing road conditions ahead to motorists. Digital signs can display these types of messages at any time and for any duration necessary. However, a digital sign may be a public safety hazard if it has a strong potential to be a primary cause of a collision. This concern can be mitigated by well-thought-out sign policy that sets out digital sign location, placement, content and operational restrictions.

Driver Issues

If digital signs are being considered over active traffic lanes, municipalities should include the following as part of their deliberations:

1. Driver Workload

Drivers undertake many tasks simultaneously. They control their vehicle, stay in a lane, watch their speed, monitor traffic, read signs and observe what is coming ahead. For a road to be safe, the driver needs time to respond. Perception and reaction time is the time it takes for the driver to notice a condition, decide what to do about it and initiate an appropriate action. If the driving environment is complex (presence of pedestrians, bicycles, heavy traffic, multiple lanes of traffic in both directions, traffic signals, turning vehicles and so on) and there are difficult or competing tasks confronting a driver, a longer timeframe will be required for the driver to select the appropriate response to initiate. If workload demands exceed a driver's capacity in some way, then the driver's ability to drive is degraded and errors may occur. If the degradation is significant and if other contributing factors such as sudden changes in traffic or unexpected roadway objects occur, then the likelihood of a collision or near-miss increases.

2. The Road Ahead

From a driver's point of view, the road ahead for at least the next one to two kilometers should be the same as the road just travelled. If it is not, the driver must be prepared for the changes ahead. To prepare a driver for the changes ahead

a driver's attention should not be distracted from the road or the signs that warn of the changes ahead. Municipalities should consider what is downstream of the proposed digital sign location and determine if there is sufficient distance from the proposed digital sign location for a driver to perceive and respond to one or more of the following:

- a. Changes to the geometrics of the road ahead, such as:
 - The addition of left or right turn lanes.
 - A divided highway that begins or ends and requires a driver to alter their path.
 - A lane reduction ahead (e.g. 4 lane highway to 2 lane highway) that requires a driver to alter their path.
- b. A signalized intersection or a stop sign controlled intersection downstream of the proposed digital sign location.
- c. Is there a curve ahead?
- d. Is there a sharp curve ahead which requires a speed reduction?
- e. Fixed or moving hazards that are within the clear zone downstream of the proposed digital sign location.
- f. The frequency and type of driveways (residential, commercial, industrial) downstream of the proposed digital sign location.
- g. Other visual clutter that may be distracting to drivers such as billboards, marquee signage, other illuminated signage.
- h. Unusual features not listed above which may surprise a driver.

3. Sign Content and Operational Restrictions

If a digital sign is being considered for placement over active traffic lanes, a policy should be developed, or current sign bylaws amended to ensure the sign is legible, readable and the content is limited to a maximum number of words and images.

How easily a sign can be read by oncoming drivers is dependent on the legibility of the sign which is dependent upon such characteristics as letter size, font, spacing of letters and words, extent of negative space (blank area of sign), contrast of lettering and images against the background, color combinations between lettering, images and background.

Research has shown that the minimum required legibility distance for a sign with a letter height of 150mm is 46.6m. At a posted speed limit of 50km/h a vehicle would travel at a rate of 13.89m/sec giving the driver 3.35 seconds to read and understand the message on a sign. In that timeframe a driver can read and comprehend five words on a sign while at the same time controlling the vehicle and observing traffic on the road. Additional reading time may be required for older drivers or drivers who are not fluent in English.

Operational restrictions for digital signs should include but may not be limited to:

- Policy must state that only static images will be allowed on a digital sign. That means there will be no animation, video, movement, pyrotechnics or flashing effects permitted.
- To minimize glare, policy must dictate the maximum brightness of the digital sign between sunrise and sunset, and a lower maximum brightness between sunset and sunrise in candelas per square metre.
- In addition to the maximum brightness thresholds, all digital signs must be equipped with ambient light sensors that automatically adjust the brightness levels to no more than 3.23 cd/m² above ambient light conditions.
- The transition time between images will have to be instantaneous (e.g. less than one second) with no transition effects between images.
- The minimum dwell time of each image must be set out in policy. For example, the timing of image changes should be such that a passing driver will see no more than one image change.
- Sequential images or messages that are consecutive (e.g. 10 second images that form one continual advertisement) whether on the same digital sign or on more than one digital sign in a row will be prohibited.

4. Other Considerations

One of the major concerns about digital signage is their compatibility with sensitive land uses, such as residential dwellings, where the illuminance of the sign at night may impact the owner or tenant's enjoyment of the property. This could be resolved by requiring the digital sign to be turned off at night.

There may be concerns related to the proliferation of signs that may impact the aesthetics of the municipality. This may be mitigated by minimizing sign clutter through the implementation of replacement ratios which requires a sign company to remove a certain number of conventional billboards for every new digital sign or billboard that is approved.

If an issue arises between the municipality and sign owner regarding sign content, the advertising industry is self-regulated through a non-profit body called Advertising Standards Canada which administers the Canadian Code of Advertising Standards. This code sets the criteria for acceptable advertising and forms the basis for the review and adjudication of consumer and advertising disputes.