



The Sign Association of Canada

Electronic Message Center Basics

A Guide to Understanding EMCs

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Sign Association of Canada
1 Yonge Street, Suite 1801
Toronto, ON M5E 1W7*

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Introduction

Gone are the days when sign owners would venture outside in the wind, rain or snow to change the letters on their changeable message signs with a ladder or pole. These signs have since evolved and are now known as Electronic Message Centres (EMCs).

In the past, EMCs featured single-colour, incandescent light bulbs configured to display information such as time and temperature. They have since grown into a dynamic medium, offering opportunities for businesses and communities to advertise goods and services, events and public information with high-quality resolution. EMCs can now be operated from a computer or even a cell phone, and programmed to display a variety of messages, information and graphics at any pre-determined time or interval.

However, with the increase in demand, availability and affordability of EMCs comes a need for effective regulation of this technology. With proper planning, EMCs can effectively operate in line with the requirements of local sign bylaws, which can help to increase their compatibility and reduce their impact on nearby properties.

This publication has been produced by the Sign Association of Canada for use by sign companies, government and the public. Through this information, we hope to enhance the understanding of EMCs and provide ideas on how to better integrate these signs into our communities.

Introduction to Electronic Message Centres

The term Electronic Message Centre refers to a sign that uses electronic hardware and software to display its copy, messages or images. This is in contrast to traditional non-electronic signs where the copy displayed is physically applied to the sign surface by printing, painting or otherwise attaching it to the sign.

Electronic message centres often replace the manually changeable copy portion of signs. The software controlling what is displayed can generate visual effects such as scrolling messages, moving patterns, fading, and variable brightness.

The benefit of an electronic message centre is that it enables the sign owner to easily change the basic information displayed on the sign. These message changes can be controlled from a remote location, providing the owner with greater versatility and flexibility in the management of the sign.

EMCs can display programming and digital content in high definition with millions of colours. The content or sign copy displayed on an EMC may be partially or fully changeable, and can be displayed in a static manner as a sequence of individual slides displayed for a fixed interval as in a slide show. Alternatively, the copy can be displayed dynamically with full motion or animation in the form of a short commercial or video.

Technology Overview

The technology used in EMCs has significantly evolved and improved over the last 30 years.

The very first electronic signs were simple – light bulbs placed in a specific pattern that turned on and off in set intervals.

From there, EMCs evolved to become programmable, which allowed incandescent light bulbs to be placed over the entire sign face, and automatically turned on and off at different times. This programmability allowed these signs to display changing messages.

There were limited improvements to this technology over the next couple of decades until an

Figure 1 - Traditional Changeable Message Centre (top photo) and Electronic Message Centre (bottom photo)



**Photo Provided by Robert Blyth*

innovative breakthrough in lighting technology occurred: the light emitting diode (LED).

The LED can be credited with the increased popularity of EMCs. Incandescent signs were only capable of displaying a single-colour, basic message with limited capabilities, and required large amounts of power to operate. LEDs use a combination of three colours (red, green and blue) which can be transformed into millions of colours, and require much less power.

EMCs are now capable of displaying virtually any computer-generated image, and can also display a wide variety of effects which include simple changes from one image to another, or full-motion video in high definition.

Benefits and Uses of EMCs

EMCs allow the ease of changing messages quickly, which creates an opportunity to more effectively respond to the needs of potential customers, and the potential for including images. All of these lead to increased sales. This allows the business to have a direct conversation with potential customers. This is particularly valuable for businesses in the retail, quick serve restaurants and hotel/lodging sectors.

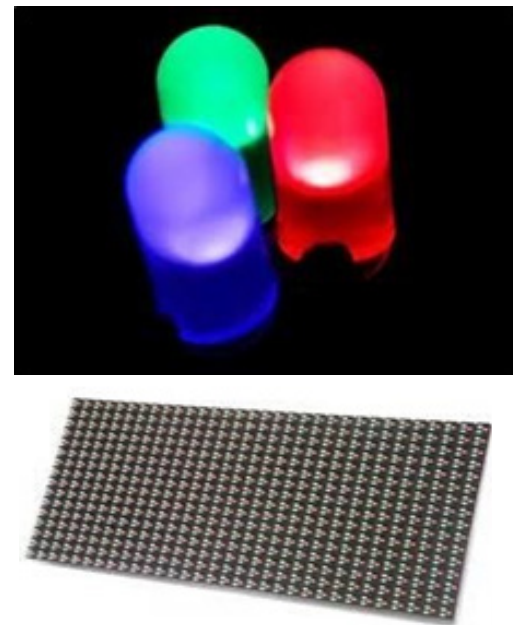
For communities and municipalities, the benefits are multiplied. Increased sales for businesses lead to increased tax revenues. By improving business viability, these signs can also reduce vacancies and blight in commercial areas. EMCs can also serve community interests by improving sign visibility, readability, and attractiveness, and by communicating public service messages.

Studies published by Rexhausen, Hildebrandt, and Auffrey for extended stay hotel chains found that those franchises using electronic message centers had a much higher occupancy rate than those with simple plastic signs.

The ability and ease with which a business can target an audience is effortless with an EMC display. An EMC allows the flexibility to change the message as the business opportunities arise. Keeping the message fresh, new and with updated and pertinent information keeps audiences engaged. This grows the business and drives sales.

Other studies have shown that by installing digital displays, customer activity and buying increased by 4.5 % after the first two months with an overall 6.5% increase after one year. Exterior electronic message centers invariably show a lift in sales performance and generate a relatively quick return on investment. While the overall sales increase is generally between 2 and 15 percent, in a high-

Figure 2 - Individual LEDs (top photo) and LED Panel (bottom photo)



volume store with low installation costs, the investment returns to using this technology can be significantly higher.

The benefits of owning an electronic message center don't stop with business. Municipalities are also gravitating towards the medium. This allows for timely messages such as boil water advisories, schooling, events and other community services. In the past, most communities relied on door to door flyer bags and radio and television advertising. They are now realizing the cost and efficiency of owning a well placed electronic message center. Defusing and delivering content at the speed of light to the community, EMCs provide increased efficiency and participation.

Increased revenues

The Small Business Administration of Canada has estimated that the installation of an EMC has the opportunity to increase business revenue by up to 150 per cent. Non-commercial entities such as schools, churches and community centres can also greatly benefit from EMCs through the ability to inform the public of changing information in a timely and effective manner.

More attractive signage

Traditional changeable message signs (see top photo in Figure 1 above for an example) can be found in many communities. Often these signs may contain mismatched letters, bland fonts, as well as other design limitations (e.g. brightness controls). Replacing the traditional changeable message signs with EMCs can result in signs that are more flexible for businesses and more compatible with the surrounding communities.

Another common use of EMCs is within a multi-tenant sign (see Figure 3); commonly found in retail shopping centres.

These signs can display information about each tenant, helping increase exposure to the travelling public. Installing an EMC at a retail shopping centre can give tenants the visibility they need without making modifications to the sign face area, which can be costly and time consuming. They also have the potential to improve the overall appearance of the shopping centre.

Prevention of signage clutter

The desire to change messages may result in some business owners using alternate methods of signage to achieve this, such as temporary signage. The proliferation of such signs can result in signage clutter. EMCs can help alleviate this; something which many sign bylaws attempt to control.

By allowing properly regulated EMCs to operate in certain communities, sign clutter can be better managed. The need for banners or other temporary signs is reduced where EMCs can be used in their place.

Display more information

Full-motion video can allow the display of information about products, services or events that can't be sufficiently conveyed using static images or text alone. EMCs that display full-motion video can also contribute to enhancing buildings or areas within a jurisdiction, particularly those areas related to major cultural, sports, or entertainment facilities. Examples include Dundas Square and the Scotiabank Arena in Toronto.

Create place making

In the right locations, EMCs can complement and support the activity and use on the properties where they are located and can provide an element of 'place-making'. They can also animate streets and the surrounding area.

EMCs in the Community

The key to addressing common concerns regarding EMCs is to ensure that matters such as the message duration, brightness and visual effects during message transition are properly controlled, while also taking into consideration the uses within the surrounding area.

Due to the potential impact on their surroundings, EMCs are not appropriate for all communities. When considering where to permit EMCs, local governments should consider the needs of stakeholders as well as other local planning objectives.

Sign Regulation in Canada

Municipalities and other governments typically regulate signs, including EMCs, through sign bylaws. Common objectives include the following:

- To provide the ability for businesses to properly identify or advertise themselves and/or their products and services;
- To manage the potential impact of signs on surrounding properties;

Figure 3 – EMC as part of a multi-tenant plaza sign



*Photo Provided by Robert Blyth

Figure 4 – One EMC can reduce the number of temporary signs that would otherwise be required to advertise special events or sales.



- To promote the compatibility of signs with their surroundings; and,
- To address concerns about public safety that may arise through the construction or placement of signs.

It is also important to remember that signs are a constitutionally protected form of expression in Canada. This poses a unique challenge for jurisdictions when developing sign bylaws, as any restriction on free expression (which is, arguably, any sign bylaw) could be challenged.

Therefore, it is important for each jurisdiction to tie the regulations in their sign bylaw to a valid policy or planning objective that has been adopted by their local Council. These objectives could include Official Plan policies, zoning bylaw restrictions, traffic safety policies or other policy objectives that have been set out following appropriate study and public consultation.

Generally, the reasons to regulate EMCs within sign bylaws are:

- To reduce the impact that they may have on nearby properties, particularly on sensitive land uses such as residential or open space; and,
- To ensure that there is no impact on public and/or traffic safety.

Due to the flexibility and programmability in modern EMCs, they are capable of meeting most of the requirements of sign bylaws with respect to brightness, visual effects, message transition or any other restrictions that may be put in place to protect surrounding uses.

Defining and Describing EMCs in Sign Regulations

EMCs differ from other signs in that they display sign copy using screens, LEDs or another electronic element. These electronic elements are then displayed in a similar fashion to traditional signs (e.g. on a building wall or on a sign structure attached to the ground). It is therefore unlikely that jurisdictions will need to develop new or unique definitions for the height or sign face area of EMCs, as these attributes are applicable to all signs.

Jurisdictions are best served by introducing definitions that describe the unique attributes of EMCs, such as the method of copy display and visual effects.

Figure 5 –Permissions and regulations for EMCs are generally related to land uses in each jurisdiction



While not an exhaustive list, below are examples of sign attributes applicable to EMCs that may require regulation:

- 'Dynamic Copy' or 'Electronic Moving Copy', which generally means sign copy that is displayed on an EMC that moves; sometimes called full-motion video;
- 'Electronic Changing Copy', which generally means sign copy that is displayed on an EMC that is fixed, but changes at regular intervals;
- 'Message Transition', which generally means the way in which sign copy on an EMC transitions from one message to the next;
- 'Dwell time', which generally means the length of time that fixed sign copy on an EMC is displayed.

In the definitions listed above, it is worth noting that there are no specific references to a technology, nor do these definitions contain numerical requirements. Due to the rapid changes in EMC technology, jurisdictions should focus on establishing definitions that will not become obsolete and/or fail to properly describe what they intend to regulate.

Where to allow EMCs

The major difference between EMCs and traditional signs is the amount of light that is generated, and the fact that the light output of an EMC can be highly variable depending on the message that is being displayed at any given time. These two factors often represent the primary impact that EMCs have on their surroundings. Both can be easily solved through adjustments to the individual sign's technical settings.

Due to these potential impacts, jurisdictions have generally limited the placement of EMCs to commercial and industrial/employment areas, or other specific areas where EMCs are considered more appropriate, such as Dundas Square in Toronto or Granville Street in Vancouver.

In addition to having restrictions on the placement of EMCs, jurisdictions will often require that EMCs be set back some distance from sensitive land uses, or other areas within a community where they may have increased potential for adverse impact (e.g. street intersections, highways, parks).

Figure 6 – EMC displaying alphanumeric copy (top photo) and an EMC displaying full images (bottom photo)



**Photo Provided by Robert Blyth*

An example of EMCs that may be permitted closer to, or within sensitive land uses, are EMCs that only use a portion of their screen or LEDs at any given time.

As can be seen in Figure 6, the EMC displaying alpha-numeric sign copy only illuminates a portion of the screen or LEDs at one time. These EMCs are likely to have less light output, and potentially less impact on surrounding properties than an EMC that illuminates the entire screen. This may make EMCs suitable for certain land uses (e.g. schools, churches, community centres) that are often found in residential or open space areas.

Identification vs. Advertising

Many jurisdictions in Canada make a clear distinction in their regulations between EMCs that identify a business and/or goods and services available where they are located (first party), and EMCs which advertise goods and services not available where they are located (third party). This distinction is generally also applied to non-electronic signs.

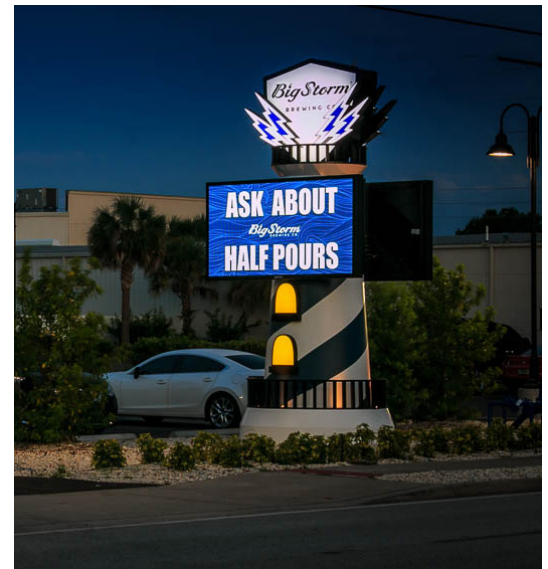
Some municipalities apply requirements for separation between EMCs in an attempt to limit sign clutter. However, if similar regulations are applied to first party EMCs, they may prevent a business from installing an EMC if their neighbor already has one within the required separation distance.

Message Changes on EMCs

It is rare that EMCs displaying static images result in an adverse impact from the messages displayed. However, the use of visual effects during message transition or the frequency that the message changes may lead to concerns. Full-motion video or rapidly changing images may increase the vitality in a commercial area, but could also lead to a negative impact in areas containing sensitive land uses, or driver distraction.

There is no evidence confirming that EMCs result in more traffic accidents. However, placing reasonable message duration times on EMCs could help to limit negative impact while still providing opportunities to display changing messages effectively. Message durations between 6 and 10 seconds are common across Canada, and supported by numerous studies.

Figure 7 – This EMC is used as part of a business identification sign (top photo). This EMC is used as an off-premise advertising sign (bottom photo)



*Photo Provided by Robert Blyth



The terminology commonly used to describe the visual effects seen during the changing from one message to another, are “Transitions” and “Effects”. Transitions occur when the content changes from one message to another, and include how one message gives way to the next, while Effects refer to the visual effects displayed when the message has movement or alternate lighting, such as blinking, flashing, scrolling, changing colours, etc.

Most jurisdictions in Canada do not permit or significantly limit the use of visual effects during message transitions. These restrictions are in place to limit the impact of an EMC on its surrounding area, such as roads and intersections.

EMC Brightness and Light Spill

Ambient light conditions generally play the largest role in determining how the brightness of the display is perceived. An EMC’s brightness and resulting light spill is also generally responsible for the impact that it has on its surrounding area.

An EMC communicates its messages by emitting a light source. The power of this light source must be constantly monitored throughout the day, depending on the variable weather conditions and amount of total ambient lighting, in order to be effective.

Today’s EMCs can adjust their brightness levels to ensure that the sign copy is visible and readable in any condition or at any time of the day without any adverse impact.

The brightness and light spill from an EMC is measured as follows:

- NITS, which is the light output which an EMC is capable of generating; and,
- LUX, which is the measured light on a reflected surface (near the EMC).

As an example, NITS is the level of brightness emitted from a flashlight, while LUX is what is visible from the light emitted from a flashlight.

Modern technology offers the ability to automatically/remotely adjust brightness levels based on ambient light conditions. Some jurisdictions require specific brightness and light spill limits for EMCs. These limits are put in place to help manage the potential impact of EMCs (as outlined above) on their surroundings.

Figure 8 – Uncontrolled brightness on an EMC can be detrimental to both the message on the sign and the surrounding community

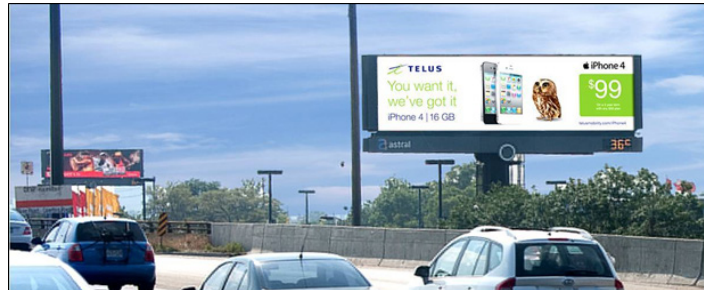


EMC Safety Information

A 2014 study completed by the City of Toronto found that while EMCs may contribute to driver distraction more than other types of signs (traditional, non-electronic signs), there is no statistical evidence that shows an increase in the number of collisions directly related to EMCs.

Ultimately, each jurisdiction needs to consider the placement of EMCs to best ensure that they have minimal impact on traffic safety. This may require an evaluation of potential impact on a site-by-site basis.

Figure 9 – EMCs in Toronto next to the Gardiner Expressway



Message to the Reader

Since 1955 the Sign Association of Canada has successfully promoted the welfare of the sign industry, improved the status of its members in the community and benefited the users of signs. However the traditional boundaries of the sign industry have expanded due to the rapidly changing level of technology and the evolution of the commercial marketplace.

The Sign Association of Canada has recognized these trends and has advanced to partner with related industries and government to create a common bond of understanding, education and trust. The Sign Association of Canada would like to take this time to acknowledge all those who participated in the research and development of this publication. We thank you for your time and efforts.

The Sign Association of Canada also provides a variety of resources available upon request. These include: Sign Type Illustrations, Top Questions Regarding LEDs and Electrical Work Every Sign Company Should Know Answers To, Guidelines for the Development of a Sign By-Law and an Overview of the Canadian Sign Industry. Contact us to obtain your copy.

We'd like to thank The Sign Association's Government Relations Committee for your contribution to this resource.

Please contact us for more information:

Sign Association of Canada

1 Yonge Street, Suite 1801

Toronto, ON, M5E 1W7

Tel: (905) 856-0000

Toll Free: (877) 470-9787

Fax: (905) 856-0064

info@sac-ace.ca

www.sac-ace.ca

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¹ A NIT is a measure of light at the source and is calculated as one (1) candela per meter squared, measured at one metre in full black-out conditions.

Technical Information

- LEDs are small, energy-efficient two-lead semiconductor light sources. When a suitable voltage is applied to the leads, energy is released in the form of photons. This effect is called electroluminescence. LEDs have the ability to brighten or dim depending on the amount of power sent to them.
- Today's technology combines LEDs into pixels, which are groupings of the three LEDs (red, green and blue). The pixels, held in place via a printed circuit board, form an array on a module. Modules are squares of LED arrays containing a set amount of pixels. These modules can be combined into various sizes of displays to create EMCs of virtually any size.
- The following table shows the brightness in NITS of a display which can be easily controlled by the photocell, allowing the brightness of the display to dim as low as required by any applicable sign bylaws.

NITS	400	500	1000	5000	7500	10000
Effective light output	4%	5%	10%	50%	75%	100%

- The industry standard for measuring EMC brightness was developed by Dr. Ian Lewin, the former president of the Illuminating Engineering Society of North America. The standard is 0.3 foot candles above ambient light, as measured from a pre-set sign-to-viewer distance. The measurement can be taken by using a foot candle (LUX) meter held at a height of approximately five feet (eye level), aimed towards a sign consistent with a sign-to-viewer distance. The measurer takes one measurement with the sign turned off (to record an ambient light reading), and then takes another measurement with the sign turned on. A difference in the two readings of no more than 0.3 foot candles indicates compliance.
- Sign bylaws can also require that the brightness of EMCs or digital billboards be regulated by a photocell, which controls the NIT output of the display. However, this method relies on manufacturers having:
 - 1) A functioning photocell placed in the south-western view of the display at the time of installation;
 - 2) Proper software communication and conversion tables to the photocell, allowing the display to dim within +200 Lumens of the ambient light level; and
 - 3) A fail-safe measure which ensures that should any part of the photocell and operating software fail or crash, the display automatically defaults to a brightness level of four per cent (4%) of maximum, and remains at this level until the necessary repairs are carried out.

- Foot candles (or LUX) measure the amount of light coming from an object, striking an unlit object at a given distance. In this case, the lit object is an EMC and the unlit object is one's eye. One foot candle is the perceived brightness of the light from one wax candle striking one's eye at one foot away. One LUX is the perceived brightness of the light from one wax candle striking one's eye at one metre away. One foot candle is very close to 10 LUX (the actual conversion is one foot candle to 10.76 LUX), and can therefore be easily converted for use in sign bylaws.
- Safety research can be divided into two types: Statistical (Post-Hoc crash studies focusing on collision data) and Human Factors/Distraction (studies with participants driving vehicles with special equipment that measure eye glances toward digital billboards.) This research would take place within a driving simulator, on a driving track or on streets.
- Most studies fall into the Statistical category. They look at multiple locations and attempt to determine whether the introduction of a stimulus (in this instance, an EMC) resulted in an increase in the number of incidents. The study begins by looking at traffic data at specific locations for a number of years before an EMC is erected. This data provides a baseline by which to judge whether there was an increase in incidents. The researcher then analyzes the same data at these locations following the installation of an EMC.
- Human Factors research looks at the way in which a stimulus affects a driver. Such studies have been done with different types of stimuli: eating and drinking, changing the radio-A/C dials, texting, etc. These studies consider how drivers may become distracted by a stimuli, and how this distraction could increase the likelihood of a crash. No such study has ever found that EMCs are so distracting that they cause an incident.

