

February 4, 2008

Honorable Robert J. Bauman
4th Aldermanic District

Honorable Michael J. Murphy
10th Aldermanic District
City Hall, Room 205

Dear Aldermen Bauman and Murphy:

In response to your letter of January 15, 2008, we are providing the following discussion on the findings and recommendations documented in a report entitled “Changeable Message LED Billboards – Test Period Observations and Findings – January, 2007 through June, 2007” concerning the regulation of electronic changeable message (LED) billboards. This report was prepared by the Department of Public Works in July, 2007 and submitted to the Common Council of the City of Milwaukee as directed under Common Council File 060300.

The report provided a discussion of recommended guidelines for the development of regulations for future installation and operation of the LED billboards to address the potential impacts of these signs on traffic safety in the City. These recommendations were based both on observations of signs installed under the test of the LED billboard technology directed by the Common Council in January, 2007, as well as a review of the literature addressing the safety impacts of the LED signs. The recommendations attempt to address two principle issues related to traffic safety which may be attributable to the installation and operation of the LED billboards, including impacts on the visibility of traffic control devices by motorists and the potential for driver distraction.

Visibility of Traffic Control Devices

Traffic control devices including traffic signs, signals and pavement markings play an important role in the operation of traffic on City streets by providing for the safe, orderly and efficient use of the roadway system. These devices provide information to motorists

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on traffic regulations, warn of conditions or circumstances requiring drivers' attention, assign right-of-way, and provide direction and guidance needed for motorists, pedestrians and bicyclists. In order to be effective, these devices must be both conspicuous and recognizable to motorists.

Several recommendations were provided in the July 2007 report which were intended to preserve conspicuity of traffic control devices by minimizing visual conflicts which may be created by LED billboards. By their placement, light intensity, or content, these signs may conceivably provide a bright illuminated background to the traffic control devices, or may effectively overpower or obscure the visual perception and recognition of these devices.

In situations where the intensity of light provided in any light display is excessive based on ambient lighting conditions, looking directly at the display may become a source of discomfort for motorists, who may then turn away to avoid looking directly at the light source. When this light source provides a background to a traffic control device, the device may not be seen or visible when drivers' eyes move to avoid this discomfort. Similarly, when excessive brightness is combined with lights of the same color as traffic control devices, traffic control devices can be totally obscured, being lost in the background lighting.

To minimize the impacts of the electronic billboards on traffic control devices, it was recommended that these signs do not in any way obstruct the view of a traffic control device, do not create a confusing or dominating background which could reduce the clarity or effectiveness of a traffic control device, or may be mistaken as a traffic control device by their color or content. Additional discussion and recommendations relative to sign placement, LED display brightness, as well as sign content and method of operation necessary to preserve traffic control device conspicuity can be found in the July, 2007 report.

Driver Distraction

The main function of roadside advertising can reasonably be described as attracting the attention of passing motorists to convey a message. Depending on the effectiveness of the advertising display, drivers' attention would therefore be diverted from the driving task.¹ Research has also shown that when there is movement involved, such as a change

¹ "Dynamic Signage: Research Related to Driver Distraction and Ordinance Recommendations", SRF Consulting Group, Inc., Prepared for City of Minnetonka, Minnesota, June 7, 2007.

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of an image in the visual periphery, it is more likely to capture a driver's attention, and signs with active components receive significantly more glances than a static sign.²

While recommendations had been provided in the July, 2007 report relative to brightness, sign content, placement, etc. which all may contribute to the degree of driver distraction that may be caused by the LED billboards, the following discussion will focus on the factors supporting the Department of Public Works recommendations on message duration. The Department of Public Works had recommended that a minimum message duration of 30 seconds be required on all LED billboards.

At the present time, all changeable message signs in the City of Milwaukee are required to comply with current City Ordinances relative to message duration. With the exception of the LED signs included in the 2007 test, current City of Milwaukee Ordinances define a minimum changeable message sign duration as 60 seconds. Recently, the State of Wisconsin enacted legislation which permits a minimum duration of six seconds on LED billboards located on Federal Aid Interstate and Federal Aid Primary routes in the State of Wisconsin. These routes include freeway facilities and several major arterials located in the City of Milwaukee. However, it should also be noted that local jurisdictions can enact more restrictive durations on signs on these facilities. The sign message duration currently contained in City Ordinances would therefore preclude the minimum message duration authorized under State Law.

To examine how sign message duration may affect the driving task and the extent to which a driver may be distracted by sign message changes, it can be computed how many times a driver will be exposed to a change of message on a sign while approaching the sign location. Table 1 presents the maximum number of messages seen while driving on a segment of roadway at various speeds, and with varying lengths of message duration. The number of changes indicated assumes a vehicle traveling at a constant speed, and does not account for stops at traffic signals or other traffic control devices. As shown in the table, a vehicle traveling at a constant speed of 35 miles per hour (typical of the average speed of vehicles on a roadway posted with a 30 mph speed limit) can expect to see at least one sign change as it approaches the LED billboard. It should be noted from this Table that the current sign message duration included in current City Ordinances, with the exception of the test sign location at East North Avenue and North Oakland Avenue,

² "Inquiry into Driver Distraction"; Road Safety Committee, Parliament of Victoria, August, 2006.

represent a maximum of one sign message change visible per passing motorist. This includes changeable message signs on surface streets as well as several LED signs authorized under the 2007 test located adjacent to Freeways in the City.

Support was found in the literature to maintain the City's current sign message duration. A report prepared by SRF Consulting Group, Inc. for the City of Minnetonka, Minnesota to assist in the development of sign regulations in that City recommended a maximum of one sign change for motorists approaching an electronic billboard. Similarly, a report prepared by Toronto Work and Emergency Services recommended a minimum sign duration of 30 seconds for billboards adjoining freeways, based on limited research on accident experience related to the operation of electronic billboards in several jurisdictions in the United States. The number of message changes associated with message duration recommended in the Toronto study would also be equivalent to the

Table 1
Maximum Number of New Billboard Messages Seen at
Various Vehicle Speeds and Message Duration Times^a

Vehicle Speed (mph)	Sign Message Display Duration (Seconds)					
	4	6	8	12	30	60
30	16	11	9	6	3	2
35	14	10	7	5	3	2
40	12	9	7	5	3	2
45	11	8	6	4	2	2
55	9	6	5	4	2	2

^a Assumes constant speed, and that sign is clearly visible at a distance of a half mile.

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number of resulting message changes on Milwaukee surface streets and freeways under current Ordinance requirements.

While support exists in the literature for Milwaukee's current minimum message duration, the most compelling research and analysis of the impacts of billboards on driver distraction was found in an August, 2006 report prepared by the Road Safety Committee of the Parliament of Victoria (VicRoads). The report was the result of a comprehensive compilation of research into driver distraction and accident experience attributable to billboards. The Vic Roads Study recommended a minimum sign duration of 30 seconds based on the findings of their research.

With respect to the LED sign located at E. North Avenue and N. Oakland Avenue where a reduction in sign duration to six seconds was permitted on a trial basis to allow observation of the safety impacts of the reduced duration time, limited sight lines diminish the impact of the changeable message billboard on distracted driving. As described in the July, 2007 report, because of the presence of obstructions to the view of the LED billboard which limits the distance from which the billboard can first be seen, the frequency of change actually visible to motorists is greatly reduced. This would not allow logical extension of the safety performance of this billboard to draw conclusions of the effect of the six second change interval on the driving task in areas which are more open and the sign is visible from a greater distance away. Additionally, only a single site was included in the evaluation. Therefore, based on the conditions at this test location which limit sign visibility, and the availability of observations at a single location only, caution must be exercised in drawing any conclusions on the safety impacts of the six second sign message duration.

The Department of Public Works recommended a minimum sign duration of 30 seconds in our July 2007 report based on research findings presented in the literature, as well as the observations of the test LED billboard located at East North Avenue and North Oakland Avenue. The 30 second message duration would in effect maintain the standard of a maximum of one message change observed by motorists on freeway facilities operating at normal speeds, but would potentially increase the number of changes visible on surface streets to a maximum of two message changes where changeable message billboards are unobstructed and visible to drivers operating their vehicles at a constant speed. This can be compared to a total of 10 to 11 message changes which would occur on roadways operating at speeds of 35 miles per hour or less with a sign message duration of 6 seconds.

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While a 30 second message duration may increase exposure to message changes visible while operating a vehicle on surface streets, signs may not be readily visible for a distance of a half mile in a number of situations such as at East North Avenue and North Oakland Avenue, where sight lines may be limited to something less by development adjacent to surface streets. Therefore, the reduction of message duration to 30 seconds may not significantly increase the number of locations where sign changes are observed with greater frequency, and the higher frequency of message changes observed would occur primarily in locations where sign visibility is unimpeded by roadside development.

One final observation should be noted concerning the Department's recommendation of a 30 second message change. While research continues into distracted driving and other potential traffic safety impacts of LED billboards, the Federal Highway Administration (FHWA) has initiated a study to examine the effects and potential risks that digital billboards have on drivers. While FHWA has funded this study, it is not anticipated that the findings and conclusions will be available until the end of 2009. As such, a more conservative approach was taken in recommending that the message duration for the LED billboards be reduced to 30 seconds from the present 60 second duration contained in City Ordinances until the results of the FHWA investigation become available and the safety implications of message duration become more clearly defined.

As noted previously, other factors relative to sign placement and operation in combination with message duration, may also contribute to intensify driver distraction. The impacts of short message duration can be intensified by sign placement, light intensity, color and sign content. If a minimum sign message duration less than 30 seconds is to be adopted in the City Zoning Code, it is recommended that the Code include: 1.) limitations on sign density to preclude a concentration of signs at any given location; 2.) strict limitations and regulation of light intensity/brightness utilized in the signs; 3.) prohibition of animated, scrolling, flashing or intermittent sign messages; and 4.) change of sign message in one second or less. These conditions would serve to reduce the degree of distraction which may be produced by shorter message duration.

We hope this information serves to clarify the findings and recommendations of the Department of Public Works' July, 2007 report on the potential impacts of electronic changeable message signs on traffic safety, as well as recommendations on methods of

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addressing these impacts. If you should have any further questions concerning this matter, please do not hesitate to contact us.

Very truly yours,

Jeffrey S. Polenske
City Engineer

Jeffrey J. Mantes
Commissioner of Public Works

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