Designing evidence-based guidelines for the safe use of digital billboard installations: Experience and results from Australia

Paul Roberts
ARRB Group
191 Carr Place Leederville, Western Australia, 6007
Email: paul.roberts@arrb.com.au
Phone: +61 8 9227 3012
Mobile +61 0427 316 278

ABSTRACT
While it is recognised that driver distraction is a contributor to highway crashes and that roadside advertising may contribute to this distraction, criteria for the management of roadside advertising devices varies significantly across jurisdictions within Australia and internationally. A number of road agencies have sponsored projects to better inform themselves about the safety implications of outdoor advertising; however this has not ameliorated the variations in jurisdictional practice. A significant emerging safety issue is the use of digital display technology for outdoor advertising signs. This technology allows the display of attention-capturing messages that may cause drivers to be even less attentive to the driving task than is the case with traditional roadside advertising. In addition, some recent digital billboards are now capable of “interacting” with drivers, by displaying personalised messages, or by encouraging drivers to call a number displayed on the billboard. This adds a further dimension of potential distraction. This Austroads funded project was designed to facilitate the harmonization of road agency criteria for the management of roadside advertising devices and promote improved and consistent good practice by road agencies.

It was concluded that fundamental human factors considerations strongly suggest that in some driving situations it is likely that the movement or changes in luminance created by digital displays will involuntarily capture attention and that particularly salient emotional and engaging material will recruit attention to the detriment of driving performance, particularly in inexperienced drivers. Where this happens in a driving situation that is also cognitively demanding, the consequences for driving performance are likely to be significant. There is compelling evidence that distraction is a major contributor to crashes. It is also clear that roadside advertising is distracting and that it may lead to poorer vehicle control. While at this time studies providing direct evidence that roadside advertising plays a significant role in distraction based crashes are currently not available, nevertheless, this is a real risk that must be considered in the provision of a safe system for driving.

Guidance principles were designed to mitigate the potential for roadside advertising to capture attention, reduce the cognitive capacity available for driving and have a negative impact on driving performance. These principles were divided into both sign design recommendations and sign placement recommendations and covered factors such as; movement, dwell time, transition time, message sequencing, quantity of information, information content / meaning, luminance, longitudinal placement, lateral placement, vertical placement, orientation / viewing angle, sight distance / visibility, and speed environment.
1 INTRODUCTION

Australia’s new National Road Safety Strategy notes that, ‘Driving is a complex task and sources of driver distraction, both within the vehicle and in the general road environment, have increased substantially in recent years’ (p. 83). While it is recognised that inattentive driving is a contributor to road crashes and that roadside advertising may be one of the contributors to such inattention, criteria for the management of roadside advertising devices varies considerably between states.

In addition, a significant emerging safety issue is the use of digital display technology for outdoor advertising signs. This new technology will enable the advertising industry to display more attention-getting messages that are likely to cause drivers to be less attentive to the driving task. Some recent work in the United States, submitted under NCHRP Project 20-7 (256) by the Veridian Group, reports that ‘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 personalised 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.’

For these reasons there is considerable interest in coming to a definitive understanding of the risks associated with roadside advertising in its various guises so that informed guidelines for the regulation of such advertising can be formulated. This project was designed to facilitate the harmonisation of agency criteria for the management of roadside advertising devices and promote improved and consistent practice by road agencies. Importantly, it will assist road agencies to understand and address a significant emerging safety issue – the use of digital display technology for outdoor advertising signs. There were four major tasks in this project: (1) review the human factors elements relevant to understanding the possible safety implications of roadside advertising, (2) undertake a literature review of original research investigating the distraction potential of roadside advertising, (3) document the guidelines, practices (and underpinning rationale) adopted by state road and planning agencies for the management of roadside advertising, and (4) develop ‘best practice’ guiding principles and guidelines for the placement of outdoor advertising signs.

2 GENERAL HUMAN FACTORS CONSIDERATIONS

2.1 Attention

2.1.1 Automatic Capture of Attention

One concern with digital billboards in particular is that drivers will deliberately attend to them at the expense of the driving task purely to see what is displayed in the next transition (the Zeigarnik Effect; see e.g. Watchel 2009). Contrary to this concern however, it has been found that drivers typically modulate their off-road glances, not looking away from the forward roadway for more than 1.5 seconds at a time (Dingus et al. 1989). Despite this, there is concern that such self-regulation could be involuntarily disrupted by the attention-grabbing properties of roadside advertising.
While the notion of attention is to some extent synonymous with voluntary, goal-directed activity, nevertheless it appears that attention may sometimes be captured involuntarily by certain events. For example, most people would have had the experience of sudden movement in their peripheral vision resulting in a seemingly automatic orienting in that direction. The question for the current purpose is, when and to what extent this is likely to occur. If one is walking alone on a dark street in a bad neighbourhood then the answer is likely to be; frequently and dramatically. But what about when it is not important, or not desirable, to display such vigilance? What happens when a digital billboard changes or animates in peripheral vision when driving? Can we avoid being distracted by such stimuli?

In recent years researchers have been investigating to what extent this attentional capture is outside of voluntary control and what kinds of stimuli give rise to it. This interest has been driven by purely theoretical considerations, but obviously has important implications for understanding the distraction potential of various kinds of roadside advertising. While there is still debate over some of the theoretical subtleties in this research, there are some clear findings of relevance to the issue of the distraction potential of roadside advertising. While some early research suggested that the appearance of new objects in the visual field was the key to predicting attentional capture (eg. Yantis & Hillstrom 1994), other research suggested that luminance changes were necessary to capture attention (Theeuwes 1995). More recent research appears to suggest that the presence of unique sensory transients may be the key to predicting attentional capture (Hollingsworth, Simons & Franconeri 2010). That is, in order to capture attention there must be a salient change in the environment that creates a new event in the observer’s sensory system. This could be luminance changes, which could arise from the appearance of a new object, or motion in a previously immobile object.

With respect to the issue of the extent to which the capture of attention is involuntary; the research is similarly complicated. While some research appears to show that involuntary attentional capture by environmental events does occur, other research suggests that this attentional capture can be suppressed (Yantis & Jonides 1990). The key seems to be that this suppression is more likely if the primary task is very demanding and requires a focussed attentional state, but that such suppression becomes less likely as the primary task becomes less demanding, requiring a less focussed attentional state (Lamy & Tsal 1999; Ruz & Lupianez 2002). The results of Young et al. (2009) showing poorer recall of road signs (suggesting greater attention to roadside advertisements) are consistent with this and are discussed in more detail below.

If we think about the typical driving task and driving environment, it is quite undemanding, with a diffuse focus of attention. Generally we can drive while talking to a passenger and looking at the scenery and roadside environment generally. Only when, for example, we are on an unfamiliar road, driving at high speed, in heavy traffic, while trying to navigate to an unfamiliar destination is the driving task likely to become demanding. Thus, the fundamental research reviewed above suggests that in typical everyday driving environments attention is likely to be captured involuntarily. In addition, this fundamental research also suggests that motion and luminance changes in digital billboards are likely to be highly effective in capturing attention involuntarily.

2.1.2 Attentional Biases
It is well known that attention may be controlled by the emotionality of information. For example, the sound of someone crying will likely attract our attention. This is not surprising
as emotional content is likely to signify that the information is important from a survival perspective. Less well appreciated within road safety is the fact that personality factors appear to dictate how attention to emotional material is controlled. For example, in a seminal study, MacLeod, Matthews & Tata (1986) demonstrated that clinically anxious subjects directed attention towards threatening material, at the cost of attention to other material, while non-anxious subjects directed attention away from threatening material. This processing bias appears to occur automatically and outside of awareness (MacLeod & Rutherford 1992).

Most et al. (2005) have provided another demonstration of how the emotionality of material may distract attention away from critical target material. They presented a series of photographs and asked participants to respond to a particular target. When the target was preceded by a photograph with a negative emotional content, participants more often missed the target than when it was preceded by a neutral photograph. This ‘blindness’ was evident up to 800 msec after the presentation of the emotional photograph. Participants who scored low on harm avoidance were more easily able to modify their cognitive processing to reduce the induced blindness when given appropriate instructions than were participants who scored high on harm avoidance.

These considerations suggest that billboards with emotional content have a greater capacity to attract and hold the attention of individuals for whom that emotional content is significant, and this may result in decrements in driver performance.

2.1.3 Limited Capacity of Attention

Once attention is captured or is strategically focussed, the processing of the material within the focus of attention competes with other ongoing processing for cognitive resources. It is well understood that processing resources may have limited capacity (Wickens 2002). This can be seen very clearly in everyday tasks such as trying to follow a news item on television while having a phone conversation; comprehension of one or the other is likely to suffer.

However, we can drive quite successfully most of the time while having a conversation. This is because large chunks of the task of driving are relatively automated and/or do not draw on the same processing resources. When this is not the case driving performance is apt to suffer. For example, because driving relies so heavily on visual information processing, driving and comprehension performance are better when instructions are presented verbally while driving than if they are presented visually (Parkes & Coleman 1990). For the same reason, billboards always have the potential to interfere with driving performance.

Even if billboards do not deflect gaze direction away from the forward roadway, to the extent that they have captured attention they are likely to reduce the processing capacity available for other visual information processing required for driving. Furthermore, as Strayer and Johnston (2001) have shown in the case of mobile phone conversations, some driving-irrelevant stimuli can sometimes be so engaging that essentially all spare capacity is recruited to the secondary task, with serious consequences for driving performance. A billboard that was this engaging would undoubtedly be a serious safety risk for driving.

Concerns about irrelevant processing consuming resources required for optimal driving performance are even more salient for inexperienced drivers. Inexperienced drivers demonstrate significantly greater impairment from secondary tasks while driving (Shinar, Meir & Ben-Shoham 1998). The most likely explanation for this is that many of the tasks
involved in driving are not yet as automatized as they are for experienced drivers and therefore compete for limited processing resources to a greater extent.

2.2 Perceptual Issues

2.2.1 Eyes off the Forward Roadway

Thus far we have considered how the capture of attention and the consumption of processing capacity by roadside advertising might impact on driving performance. Another way in which roadside advertising is likely to impact on driving performance is via inappropriate visual fixation, usually away from the forward roadway. That is, even if cognitive capacity is not being consumed to such a degree as to impair driving performance in itself, the fact that a driver is not looking in the correct direction to safely negotiate the road and other traffic may result in an incident, especially if conditions change suddenly.

In a key finding in this area, Klauer et al. (2006), in an analysis of the 100-Car Naturalistic Driving Study, found that glances away from the forward roadway for more than two seconds doubled the near-crash and crash risk compared to baseline. This result is averaged across all road types and traffic conditions. One can imagine that in challenging road environments in heavy traffic this risk would be much greater. At 70 km/h a two second glance away from the forward roadway equates to just under 40 m of travel down the roadway. In certain road environments and in heavy traffic it becomes quite likely that conditions in the forward roadway will have changed over this distance and hence that a driver not looking ahead will not be able to respond appropriately to these changes.

2.2.2 Visual Clutter

It seems intuitively plausible that the presence of driving-irrelevant material in the driving environment will hinder the apprehension of driving relevant information. A key prediction from this hypothesis is that increased visual clutter (defined as driving irrelevant stimuli) will result in decreased ability to locate critical information. Consistent with this, when Ho et al. (2001) asked participants in their experiment to rate driving scenes as either high or low clutter, they found that scenes rated as high clutter resulted in more errors when searching for a target sign. McPhee et al. (2004) found that this kind of impairment was further exacerbated by requiring participants to engage in a listening and comprehension task simultaneously with the search task. In addition they found that older adults performed more poorly than younger adults on the search task.

While these results imply that we should be careful not to clutter the road environment with driving irrelevant items, including roadside advertising, it does not provide an easy to use, objective measure of clutter that could be used to make decisions about the installation of additional objects in road environment. While there has been some recent research aimed at deriving a metric for clutter (Rosenholtz, Li & Nakano 2007) this is not sufficiently developed to allow its application to a road environment. On the other hand, given that subjective estimates of clutter appear to be reliable and predict key aspects of driving performance (Ho et al. 2001; McPhee et al. 2004), it may be sufficient for practical application to use a subjective judgement of clutter until clutter assessment tools are available.

A better approach is currently being developed by Edquist et al. (in prep). They have provided evidence that clutter can usefully be conceptualised as falling into three categories –
Built (buildings and other infrastructure), Designed (road markings and traffic control devices) and Situational (vehicles and other road users). Their experiments suggest that multi-storey buildings close to the road (such as typical commercial developments) and a larger number of traffic control devices on view (more than three at any one time) have a negative effect on driving performance. It also seems likely that high traffic volumes (high situational clutter) will also have a negative effect on driving performance although this has not been clearly demonstrated in their research to date.

2.3 Summary
Most drivers, in most driving situations, most of the time, probably possess substantial spare cognitive capacity for the processing of driving-irrelevant information. Given this, and given the exploratory nature of human cognition and the likelihood that drivers attempt to maintain an optimal level of arousal via task difficulty homeostasis (Fuller 2005), it may be very difficult to prevent drivers from directing attention away from the driving task (Trick & Enns 2009). This in itself is not necessarily undesirable as it may serve to maintain an appropriate level of arousal, thus combating the negative effects of monotony (e.g. Oron-Gilad, Ronen & Shinar 2008). Indeed, in a recent Austroads (2011) study it was found that roadside signage that was designed to engage drivers in some mental activity, improved driver alertness.

The key question is whether there are situations or individuals where processing is recruited or interfered with by driving-irrelevant material to the detriment of driving performance. The considerations reviewed above suggest that the answer to this is in the affirmative. While attention may be less likely to be captured by irrelevant material in a demanding driving situation, it is clear that in some driving situations it is likely that movement or changes in luminance will involuntarily capture attention and that particularly salient emotional and engaging material will recruit attention to the detriment of driving performance, particularly in inexperienced drivers. Where this happens in a driving situation that is also cognitively demanding, the consequences for driving performance are likely to be significant. Furthermore, if this attentional capture also results in a situation where a driver’s eyes are off the forward roadway for a significant amount of time this will further reduce safety. Additionally, road environments cluttered with driving-irrelevant material may make it difficult to extract the information that is necessary for safe driving, particularly for older drivers.

3 THE SAFETY IMPACT OF ROADSIDE ADVERTISING

3.1 Distraction as a Safety Issue
Studies based on crash reports suggest that perhaps 30% of all crashes involve driver distraction (Wang, Knipling & Goodman 1996) and in around 30% of those the distraction is from outside the vehicle (Stutts et al. 2001). However this source of data is likely to underestimate the contribution of distraction to crashes as drivers are unlikely to admit to such a cause and police may be unwilling to assign distraction as a cause without eyewitness testimony.

In one of the most compelling studies to date, Klauer et al. (2006) analysed the consequences of driver inattention using data from the 100-Car Naturalistic Driving Study. While brief glances away from the forward roadway for the purpose of scanning the driving environment were found to actually decrease the crash risk, glances of two seconds or more
doubled the crash risk. In addition, this risk was further increased for certain demanding traffic environments such as intersections and high density traffic. Some of the riskiest kinds of inattentive driving that contributed to crashes and near crashes in the Klauer et al. (2006) study originated from either drowsiness or in-vehicle distractions. Importantly, looking at an external object exhibited the second highest significant odds ratio of all distractions (reaching for a moving object produced the highest significant odds ratio), with a driver 3.7 times more likely to have a crash or near crash when looking at an external object. However this kind of distraction accounted for less than 1% of all crashes and near crashes in the study. Thus while looking at an external object appears to be quite risky behaviour when it is engaged in, it is not a frequent cause of crashes overall.

3.2 Roadside Advertising as a Safety Issue

While the Klauer et al. (2006) study does not identify which external objects drivers were looking at when they were so looking, a number of studies have attempted to investigate whether distraction from roadside advertising specifically, might contribute to crashes.

Crundal et al. (2006) showed participants in their study video clips taken from the driver’s perspective and asked them to either scan for hazards only or to look for advertisements also. Advertisements were either at street level or raised 3 m above street level. The core finding from this study was that street level advertisements attracted more attention than raised advertisements when drivers were instructed to look for hazards. Crundal et al. (2006) suggest that this occurs because street level advertisements fall within the normal window within which drivers habitually scan for hazards and that advertisements within this window are inappropriately capturing attention.

Of course this study is somewhat removed from the experience of actually driving, simply requiring, as it does, that drivers passively watch a video (although note that Crundal et al. (2006) discuss why there is good reason to believe that their methodology in this study appropriately taps the key aspects of the driving task).

This concern does not arise in the study by Lee, McElheny and Gibbons (2007). In this naturalistic study drivers drove an instrumented vehicle around a 50 mile loop in Cleveland Ohio. They found that drivers took longer glances at digital billboards than at conventional billboards and baseline sites. While there has been some criticism of their methodology and conclusions (Wachtel 2009) it would be agreed by all parties that Lee, McElheny and Gibbon’s results show that in real world driving, digital billboards can be more distracting than conventional billboards.

Young et al. (2009) conducted a simulator study to investigate the effect of conventional roadside advertising on driver attention and performance. Drivers experienced urban, rural and motorway environments, with and without billboards. The presence of billboards was found to impair lateral control. Similarly, Edquist et al. (2011) found increased delay in the time taken to change lanes in response to signs in a simulator study was delayed by the presence of billboards, although not to a greater extent for changeable digital billboards. The negative impact of roadside advertising on lateral control has also been reported by Bendak and Al-Saleh (2010) in their simulator study. While the frequency of ‘crashes’ in Young et al.’s study was too low for statistical analysis, it is worth noting that there were three times as many crashes in the presence of billboards compared to driving conditions where billboards were absent. Interestingly, they also found that participants displayed significantly poorer recall of road signs in the motorway and rural driving conditions, compared to urban driving
conditions, suggesting that participants were spending more time processing advertisements in these less demanding driving scenarios, at the expense of attending to information that is important for safe driving.

Chattington et al. (2009) conducted a simulator study comparing the effect of static roadside advertising and moving video advertisements. They found that video advertising was significantly more distracting than static advertising, as indicated by more and longer glances towards the advertising. In addition, video advertising was found to reduce the ability to maintain a constant speed and lane position to a greater extent than static advertising.

In recent times, very few studies have attempted to investigate the impact of roadside advertising on actual crash rates. Smiley et al. (2005) investigated the impact of video advertising in Toronto on driving performance in a series of studies, including a before–after installation comparison of crash rates. While Smiley et al. found no statistically significant effect on crash rates overall, they note that sample sizes were not large enough to detect any effect that might accrue from the presence of the billboards. The descriptive statistics in this study however, are consistent with a relative increase in collisions, of all the various types, at the approaches to the video advertising sites.

There are a number of much older studies investigating the effect of roadside advertising on crash rates, but of course these do not deal with modern digital technology. In a review of these older studies, Wallace (2003) concludes that, while many of them are correlational, thus making it difficult to unambiguously attribute causality, nevertheless, ‘the case for arguing that visual ‘clutter’ at junctions (associated with billboards and signs) can lead to unsafe driving is very strong’ (p. ii).

### 3.3 Summary

There is compelling evidence that distraction is a major contributor to crashes. However, studies providing direct evidence that roadside advertising plays a significant role in these distraction-based crashes are currently not available. The studies that have been conducted show convincingly that roadside advertising is distracting and that it may lead to poorer vehicle control. However, the evidence is presently only suggestive of, although clearly consistent with, the notion that this in turn results in crashes. It is also worth noting that, on the basis of Klauer et al.’s (2006) results, that while looking at an external object increased the crash risk by nearly four times, less than 1% of all crashes and near crashes were from this source of distraction. A substantial proportion of these external objects would not have been advertising signs. Thus, while it is not possible to tell from the reported results, it is reasonable to conclude that far less than 1% of all crashes and near crashes involved distraction from roadside advertising.

### 4 BEST PRACTICE GUIDANCE RECOMMENDATIONS

Australian and New Zealand jurisdictions are now firmly committed to the safe systems approach to road safety. This approach, which is derived from the Swedish, Vision Zero and Dutch, Sustainable Safety approaches to road safety, has at its core the recognition that road users are fallible and will make mistakes, even if alert and intending to comply with the road rules. As a result, vehicles and road infrastructure need to be designed to discourage errors and protect against the consequences of errors when they do occur. Within this philosophical context it is difficult to see how adding roadside infrastructure that has the potential, however minor, to encourage driver error (through distraction) could be justified.
However, as we have seen, the human factors issues are not straightforward when attempting to be definitive about what is and is not desirable from a distraction perspective. Firstly, in some environments, some level of appropriate roadside ‘distraction’ may be desirable. Secondly, it seems very likely that if drivers are not completely engaged by the driving environment they will spontaneously engage in other ‘distracting’ activities. Finally, it appears that in many cases drivers regulate their engagement with potentially distracting stimuli so that its distraction potential is controlled to some extent. This does not mean that roadside advertising is of no concern, but it does mean that there are situations where it is unlikely to compromise the integrity of the Safe System. The key is to specify the principles that are important in determining those situations.

Based on the considerations discussed above, the following guidance recommendations are provided. These are divided into sign design guidance and sign placement guidance. The recommendations are specifically targeted at digital billboards and their potential for distraction and should be considered to be an addition to existing guidelines relating to conventional billboards. While these recommendations follow logically from the considerations reviewed above, it is important to keep in mind that, by and large, they have not been empirically evaluated in any direct way. For this reason it will useful to test the precise impact of the suggestions made below, for example in simulator studies.

4.1 Sign Design Guidance

4.1.1 Movement
Roadside advertising devices should not contain motion, changes in luminance or any effects that create the illusion of movement.

4.1.2 Flashing Lights
Roadside advertising devices should not contain flashing, blinking, revolving, pulsating or intermittent lights.

4.1.3 Dwell Time
This should take account of (1) visibility distance [VD]: the maximum distance from the sign at which the sign face becomes visible to drivers and (2) speed environment [SE]. The goal is to limit the number of message changes that drivers are exposed to. Therefore an advertising device that is visible from 1000 m away on a 60 km/h road needs to have much longer dwell times than an advertising device that is visible only from 100 m away on a 100 km/h road.

All drivers will see at least one change if:
Dwell time (sec) < VD (m)÷{SE (km/h) x 0.28}.

Ideally, the proportion of drivers (PD) who see a change should be much less than 1.
Therefore:
Dwell time (sec) > VD (m)÷{SE (km/h) x 0.28}.

For a desired PD:
Dwell time = VD (m)÷{SE (km/h) x 0.28 x PD}
4.1.4 Transition Time
Message should change instantaneously. That is, no ‘fade’, ‘zoom’ or ‘fly-in’ effects and no blank screen between messages.

4.1.5 Message Sequencing
Sequencing of messages should be prohibited.

4.1.6 Quantity of Information
For text, this should be consistent with the number of words that can be read during the approach interval and also the number of words that can be read in a 2 second interval (the ‘eyes off the road’ interval at which the crash rate doubles). This can be achieved by (1) estimating the legibility distance \([LD]\): the distance at which the text first becomes legible, (2) taking into account approach speed – the speed environment \([SE]\), (3) estimating the comprehension rate \([CR]\), and (4) ensuring that attention of more than 2 seconds is not required to comprehend the message. Therefore:

\[
\text{Number of words} < \frac{\text{LD (m)}}{\{ \text{SE (km/h)} \times 0.28 \}} \times \text{CR (sec)}.
\]

And:

\[
\text{Number of words} < \text{CR (sec)} \times 2.
\]

In general, a typical comprehension rate would be approximately three words per second, but this will vary for different text sizes, fonts and formats. As a result the CR may need to be tested and demonstrated in the application process.

4.1.7 Colour
Advertising devices should not be coloured like an official traffic sign or traffic signals.

4.1.8 Information Content/meaning
Advertising devices should not imitate traffic control devices or give instructions to traffic to 'stop', 'halt' or other (e.g. give way, turn left or merge). Advertising devices should not contain extreme emotional material, especially content which could be threatening or anxiety provoking.

4.1.9 Luminance
Luminance levels should not exceed those of static signs in typical ambient light conditions.

4.1.10 Dimensions
Advertising devices should not be shaped like an official traffic control sign/device.

4.2 Sign Placement Guidance

4.2.1 Longitudinal Placement
Advertising devices should not be located in such a way that they might interfere with the effectiveness of a traffic control device (e.g. by restricting sightlines or distracting from traffic control devices via proximity or as a background). Advertising devices should not be
located so that they are visible at the approach to, or from, an intersection, pedestrian crossing, tram stop or in any location that is likely to be highly demanding of attention. Only one advertising device should be visible to drivers at any time.

4.2.2 Lateral Placement
Without conflicting with clear zone requirements (e.g. installation of post in a hazardous location), advertising devices should not be placed such that drivers must divert their gaze away from the forward roadway in order to comprehend the sign message.

4.2.3 Vertical Placement
Advertising devices should not be placed at a height that coincides with the normal ‘hazard viewing window’ that drivers scan. That is, they should be elevated above the height of vehicles, pedestrians and traffic control devices, but not so high that they draw the gaze away from the forward roadway.

4.2.4 Orientation/Viewing Angle
Advertising devices should be oriented to facilitate legibility from the maximum legibility distance and across the full approach distance.

4.2.5 Sight Distance/Visibility
Advertising devices should be placed so that enough time is available on approach for drivers to comprehend the message. That is, the sight distance must correspond to the required legibility distance.

4.2.6 Speed Limit/Speed Environment
The speed environment on its own is likely to be less important than the overall risk profile of the road and driving demand characteristic of the road section which should be carefully reviewed.

4.2.7 Other
All installations should consider the overall risk profile of the road environment in question and the driver demand of the road section (e.g. crash history, iRAP ratings, traffic volume, speed, complexity, clutter). In particular:

Black spots and road sections with less than a 3-star rating (iRAP or equivalent) should be ruled out for advertising device placement. Highly cluttered road environments should be ruled out for advertising device placement. The installation should be reviewed at regular intervals and audited against the guidance principles (because crash rates, traffic volume, the built environment etc. will change over time). Advertising signs should not be placed on the same posts as traffic control devices.

REFERENCES


Outdoor Media Association 2010, Discussion paper: digital billboards and road safety: an analysis of current policy and research findings, OMA, Sydney, NSW.
Strayer, D. L., & Johnston, W. A. 2001, Driven to distraction: Dual-task studies of simulated driving and onversing on a cellular phone Psychological Science, 12, 462-466
Wachtel, J 2009, Research for AASHTO Standing Committee on Highways task 256: safety impacts of the emerging digital display technology for outdoor advertising signs, National Cooperative Highway Research Program, Washington, DC, USA.