

# THE EVALUATION OF CONTENT ON OUTDOOR ADVERTISEMENTS

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## ABSTRACT

Using the length of messages (number of bits) on advertisement content as the only quantitative criteria in the evaluation of the sign face was identified as a problem. Accident statistics were evaluated to determine the relationship between advertisements and increased accident rates and it was found that in general, advertisements result in higher accident rates. No accident data related to the content of advertisements was however found. This study investigates an analytical approach to evaluate the contents on advertisements, based on the characteristics of the driver. These characteristics include vision, reaction time, reading time, legibility factors, spare capacity to process information and selective attention. A parallel is drawn between a driver's reading of road signs and the reading of outdoor advertisements. A concept of the critical zone - the 500m in front of an advertisement - is developed and the control of content in this zone is quantified.

Rules are proposed to evaluate the content for advertisements that will hopefully provide a more practical, defensible approach to evaluate the content of outdoor advertisements.

## 1. BACKGROUND

The South African National Roads Agency Limited (SANRAL) promulgated Regulations on Outdoor Advertising and Control in December 2000. Since then, SANRAL received hundreds of applications for the erection of outdoor advertisements and have subsequently approved several thereof.

The regulations provide specific rules for the control of the following:

- Positioning of advertisement structure
- Size of advert
- Controlling advertisement content (also known as "faces")

The rules provided in the Regulations are well defined and have been used to approve the position and size of all the advertisements.

The next stage in the evaluation and control of outdoor advertisements is the regulation of the content on the advertisements. The extent of this control task is underestimated, as it is a continuous process, with advertisements changing quite often. In the application of the regulations, several problems were experienced with the evaluation of content.

These typically include:

- Using "bits" of information as the only quantitative criteria to evaluate content. Other controls in the regulations are vague.

- Graphic designers / advertisers are “not on the same wavelength” as the engineers and not as concerned with road safety.
- No clear evidence exists that advertisements increase accident rates - advertisers often erect an advertisement face and only apply later for approval - the fact that the existing one does not “cause accidents” is then used as an argument in the application.
- Different Councils and Road Authorities apply different rules – these create precedents.

These problems led to a study of the existing regulations and a literature study of the existing information available on the impact of advertisements on road safety. The objectives of the study were to:

- Evaluate existing available accidents statistics related to outdoor advertisements.
- Develop a better methodology for evaluating information content on advertisements and develop rules that are easier to enforce.
- Develop a “common sense” approach to obtain buy-in from advertisers.

It should be noted that opinions and findings in this paper represent that of the author and not necessarily that of the SA National Roads Agency.

## **2. SANRAL REGULATIONS**

The regulations control position, size and content of advertisements. The relevant regulations are briefly summarised below.

### 2.1 Regulations for positioning of advertisement structure

- Designation of area (urban min, partial, max control, rural, natural)
- 200m from road signs
- 250 m from other advertisements
- No advertisements 1 km before interchanges
- 50 / 100 m from intersection
- 200 m from ramp gore

### 2.2 Regulations for size of advertisement

- Small billboard (< 18 sqm)
- Large billboards (> 18 sqm – no maximum size defined)
- Electronic Billboards < 18 sqm
- Project boards < 9 sqm
- On premises business advertisements < 12 sqm
- Service Facility Signs: 14 sqm – 120 sqm

### 2.3 Regulations for content of advertisement

The major controlling factor provided in the Regulations, are the number of bits of information allowed on an advertisement face. “Bit” is defined as the unit for measuring length of messages – letters, digits, symbols, logos, graphics and abbreviations. They have the following values:

#### 2.3.1 Bit values (Regulation 1):

Words up to 8 letters:	1 bit
Words > 8 letters:	2 bits
Numbers to 4 digits:	0,5 bit
Numbers 5 – 8 digits:	1 bit
Symbol / Abbreviation:	0,5 bit
Logo / graphics:	2 bits

Apart from the number of bits, the following regulations are provided to control the content of advertisements:

<u>Reg. Nr</u>	<u>Description</u>
6(1)(b)	may not distract attention of driver in a manner likely to lead to unsafe driving conditions
6(2)(a)	may not affect conspicuousness by virtue of potential visual clutter
6(2)(b)	size, color, letter size, graphics etc having distracting effect on the attention of the driver
6 (d)	The color, or combination of colors in advert may not correspond with colors of road traffic signs
6 (f)	Bits must be within limits as defined in Regulation 1.
7	Amenity and Decency
8.	Advertisement to be concise
8 (a)	No advertisement displaying a single message may exceed 6 bits on freeways and 10 bits on other roads
8 (b)	Combination signs, or any other advert displaying more than one message may contain more than 6 bits per enterprise, service or message
8 (c)	Numbers longer than 8 digits not allowed
8(d)	Street names min size 150 mm, max 350 mm
8(e)	No message spread across more than one advert
9 (d)	Any advertisement must have a neat appearance in terms of content and sign writing and may not contain untidy handwritten messages
40(4)	Agency may in respect of road safety, request letter sizes and length of message

Reading the above regulations, it is clear that some regulations are difficult to apply in practice as they can be interpreted in several ways. Some regulations are also perceived to be unnecessary strict, such as the definition of bits - a typical example being the bit value of small words like “the”, “and” etc. New proposals are made in Section 5 to make the applications of the regulations more practical.

### **3. ADVERTISEMENTS AND ACCIDENTS - AVAILABLE RESEARCH**

#### 3.1 Research Results

A literature survey was conducted to determine what research is available on the impact of advertisements on road safety and on increased accidents. One of the key discoveries was a document compiled in 1980 for the Federal Highway Administration, titled: “Safety and Environmental design considerations in the use of Commercial Electronic Variable Message Signage”. The study summarised the findings of several other research projects on the impact of billboards on traffic safety and accident rates. The most important findings of 6 different studies are outlined below.

##### 3.1.1 Minnesota Department of Highways Field Study 1951

A study of 713 accidents occurring along 675 km of road was done. It was found that an increase in the number of advertisement signs per mile was accompanied by an increased accident rate. Intersections with 4 or more advertisements had an accident rate 3 times higher than those with no advertisements.

### 3.1.2 Iowa State College Field Study 1951

Accident rates immediately upstream of billboards and immediately downstream were evaluated. The accident rates upstream were found to be double upstream than those downstream.

### 3.1.3 Michigan State Highway Department Field Study, 1952

In their study, the Michigan State Highway Department found a conflicting result, namely: "Advertising signs have practically no effect whatever on the accident experience of this road". Despite their general finding, they did also conclude that: "Illuminated signs, of the neon type, showed an appreciable association with accident locations".

### 3.1.4 Lauer and McMonacle, Laboratory Investigation, 1955

The first simulator test was done by Lauer and McMonacle to evaluate the impact of advertisements on the drivers "efficiency at the wheel". Similar as the previous study, they found: "The presence of numerous signs in the drivers field of vision in no way influenced the efficiency at the wheel adversely".

It is important to note that in the 1980 study, the results of the simulated environment were questioned and the fact that the simulated results were not validated against real life scenario. The results should therefore be interpreted with caution.

### 3.1.5 New York State Thruway Field Study, 1963

In their study, they investigated 1550 "driver inattention" accidents. The on site accident reports were studied and it was found that 32,6 % of the 1550 accidents, occurred on the section where motorists were exposed to advertisements. The total length of the road section investigated was 1800 km with advertisements on 236 km (or 13,1 %) thereof. It was found that 1,06 driver inattention accidents occurred per km where advertisements were present and 0,31 driver inattention accidents occurred per km where NO advertisements were present, a significant difference in accident rates.

### 3.1.6 Faustman, California Route Field Study, 1961

The accident statistics on a 64 km section of US 40 interstate highway were analysed. Specific attention was given to geometric design aspects to ensure that the impact of other factors on accident statistics, for purposes of comparison, were minimized. Characteristics that were selected to be approximately the same included road cross section, design speed, access control, traffic volume, vertical alignment, few roadside developments and equal quality law enforcement and accident reporting. The accident statistics, traffic volume, advertisement positions etc were plotted and evaluated.

It was found that 34 sections of 0,4 km each - total 13,6 km - had advertisements present. The accident rate on these sections was 1,59 accidents per million vehicle km, whereas the accident rate on the sections without advertisements present, were 1,13 accidents per million vehicle kilometers. This represents a 41 % increase.

The same data was further analysed by Weiner in 1973 and he determined that there is a relationship between the number of billboards present along a section of road and expected number of accidents, as shown in the table below.

Table 1. Re-analysis of California Data.

No. Billboards	Expected Number of Accidents in 5 years	Cumulative increase in Accident Rate
0	5.92	0.0%
1	6.65	12.3%
2	7.38	24.2%
3	8.11	37.0%
4	8.84	49.3%
5	9.57	61.7%

### 3.2 Synthesis of accident statistics

The following can be derived from the accident statistics provided above:

- The studies provide evidence that billboards result in higher accident rates. The rates reported vary from “3 times higher at intersections”, 41 % increase and 62 % increase. There is however some conflicting results from certain studies, one of which the results were questioned later.
- The studies do not state anything about advertisement content and the impact thereof. In every case the presence of advertisements were evaluated against the “non presence” of advertisements, content was not specifically evaluated. In one case the presence of “neon” signs was found to be responsible for increased accidents.
- Limited information is available on the spacing between advertisements on these road sections.
- In some cases it is stated that the quality of reporting (accident reports) is a problem. This is similar to the South African experience.
- Environmental context – geometry, speed, grade, etc. makes it difficult to separate impact of advertisements in a “before- and after study”.
- The accident statistics quoted certainly show that in general, advertisements result in increased accident rates. In the Commercial Electronic Variable Message Signs (CEVMS) study done in 1980 it was found that “courts have fallen back on the readily understood logic that a driver cannot be expected to give full attention to his driving task when reading a billboard”. The problem with accident statistics is that it is extremely difficult to pinpoint the exact cause of an accident where advertisements can possibly be involved.
- At this point in time South Africa, decisions have already been made to allow advertisements along all categories of roads under certain conditions. These accident statistics should therefore be seen as proof that outdoor advertisements should be controlled, not banned entirely.
- Accidents are relative rare events. It is therefore necessary to also study conflicts and “near misses” to obtain an understanding of the potential impact of advertisements.

This background, that limited empirical proof of advertisements resulting in more accidents exists, necessitates an analytical investigation of the impact of advertisements. The following section investigates the driver, his reactions and the potential impact of advertisements (especially advertisement content) from an analytical point of view.

## **4. UNDERSTANDING THE DRIVER**

To study the impact of advertisements on the driver from an analytical point of view, it is necessary to investigate the factors that determine the driver’s performance. These factors are listed below.

### 4.1 Vision or Eyesight

This is the only sensory power that the driver uses to gain information on the road ahead. A few important aspects of vision are listed below:

- The National Road Traffic Act (Act 93 of 1996), 15 (1) (e) (vi) states that “a Person is not

allowed to obtain a learners driving license if he/she suffers from defective vision ascertained in accordance with a prescribed standard". The Road Traffic Act Regulations, 102 (1)

- Licence codes A1, A, B or EB defines this more specifically as follows:
  - The driver must have minimum visual acuity of 6/12 (20/40). The normal persons eye is at rest at 6m, 6/12 means a person with slight seeing disability can see at 6m what a normal person can see at 12m. (20/40 is in feet).
  - the driver must have a minimum visual field of 70 degrees temporal, in respect of each eye, or if one eye is blind, a visual field of 115 degrees
- Ogden, KW, in "Understanding the driver" states that drivers have a limited visual field – focal vision narrows with increasing speed. A driver typically has 3 to 10 degrees visual field when stationary - this field of vision narrows to 1 degree at 120 km/h. It is also stated that a driver has peripheral vision of 70 degrees.
- The design criteria used in the South African Road Traffic Signs Manual (SARTSM) is a horizontal cone of vision of 15 degrees - the reason being that beyond 15 degrees a driver cannot determine the alignment of the road
- One of the design criteria for road signs in the SARTSM is based on legibility of letters, font type and size. The font type used for road sign letters is DIN A and DIN B. The legibility factors provided for this letter type is 0.5 m/mm (Night time reduced to 0.4 m / mm) - which implies that 1m high text can be read at 500m and 300 mm high text can be read at 150 m. It is assumed that the legibility of font types varies, but will be similar in value for the purpose of this study.
- SARTSM also states that drivers have a fixation rate of 1,0 to 1,5 fixations per second - i.e. they can focus and interpret 1 to 1,5 items per second. The design criteria used in SARTSM is also that a driver should not remove his focal vision for more than 1,5 seconds from the road to allow safe driving. This is in line with what Beijer et al found in 2001, namely that drivers glance at freeway signage only once every 12,5 seconds and that each glance range between 0,9 to 2,5 seconds, with an average of 1,6 seconds.
- A critical impact of outdoor advertisements, is that the amount of information (bits) determine the time required for a driver to read the advertisement. For road signs, a reading time formula is provided in SARTSM:

$$T = (0,32 N - 0,21) \times D$$

T = Reading time

N = Bits on signs

D = Distraction Factor

D = 1,00 straight roads, less than 5000 vehicles per day (vpd)

D = 1,25 straight roads with 5000 – 30 000 vpd

D = 1,50 freeways, roads in urban areas, more than 30 000 vpd

Typical reading times are then as follows:

N (bits)	T (D=1,25)	T (D=1,5)
3	0,9 sec	1,1 sec
6	2,1 sec	2,6 sec
8	2,9 sec	3,5 sec
12	4,5 sec	5,4 sec

It is debatable whether this is applicable to outdoor advertisements, but it provides an indication of the time required to read certain content.

#### 4.2 Reaction time and driver expectancy

In the analytical approach to how drivers will react, reaction time is critical - the time from when an incident is detected and the driver physically starts reacting by swerving or braking. Driver expectancy is the factor where, for example, a driver will follow another vehicle at 120 km/h with a following distance of 20m and feel safe, due the fact that all the previous times that it was done, the vehicle in front did not brake, so it is expected the vehicle will not brake now.

#### 4.3 Human information processing capacity

The requirement of drivers to process information at high speed, account for 50% of human error in traffic accidents (Lamm, 1999). Treat, et al, found in 1977 that delayed recognition of hazards and inattention of drivers was of the largest factors leading to accidents.

Ogden, KW found that in some cases the driver may have inadequate information to handle a certain driving task (e.g. a missing road sign warning of a sharp curve), in other cases the driver will be provided with too much information and due to his limited processing capacity, the driver will shed some of this information.

It was found that human sensory processing capacity is  $10^9$  bits per second (1 MHz). Relating this to computer terms it can also be called “bandwidth”. Ogden describes a phenomenon called “self pacing”. A driver will do the critical tasks necessary including control of the vehicle, navigating and will then have spare capacity to do other tasks. Spare capacity is defined as a person “operating at less than full information processing capacity and can cope with an additional task performed simultaneously”.

It was found by Johnson & Cole in a Laboratory Study in 1976 that humans have a selective attention process - in other words when driving, they will perform the critical task first. Drivers are not forced to look at advertisements - if the driving task require more attention, the driver will typically ignore the advertisement. However it was found that if a sign has a “*high attention getting*” character, it will assume primary importance and will require increased reading time.

To illustrate the concepts of limited human processing capacity, spare capacity and the potential impact of “high attention” advertisements, Figure 1, as illustrated below, was developed.

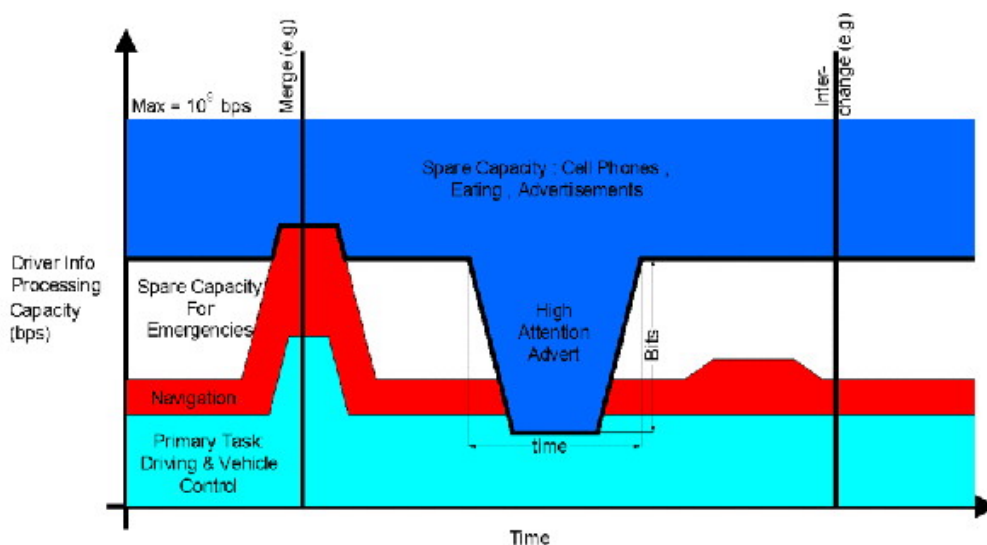


Figure 1. Human processing capacity and spare capacity when driving.

The x-axis shows time as the driver is traveling along the road, whereas the processing capacity is shown on the y-axis. The driver will typically perform the basic task of driving using the “bottom” range of his processing capacity. This will consist of two elements, one being driving and vehicle control, the second being navigation. The processing required for navigation will typically increase in front of interchanges and the control task will require more processing capacity when merging after an interchange.

There should then remain a certain bandwidth of spare capacity that the driver will use in emergencies such as a tyre bursting, if the vehicle in front suddenly brakes, etc. The “top” range of the spare capacity is then used by the driver to perform other tasks such as talking on his cell phone, eating, talking to other passengers or looking at advertisements.

If an advertisement is a “high attention” advertisement, it will use a large portion of the driver’s information processing capacity for a period of time. The danger exists that the portion of his capacity used for driving and control will also be taken up by processing the information on the advertisement. The critical scenario will happen when the time that the advertisement distracts the driver from the driving task, becomes too long that he will start swerving laterally in the lane he is traveling in or will not be able to react to incidents such as vehicles braking in front, etc.

To define “high attention” advertisements is not a simple task. In a study by the Outdoor Association of America in 1999, it was found that bright colours, especially yellow, attract attention. It is obvious that advertisements containing human faces or the human body also attract attention.

The capacity of the human to process information is used as the basis for the analytical approach. The critical assumption is the selective attention process of the driver, i.e. that he will first control the vehicle and will then do other tasks using his spare capacity.

## **5. PROPOSED METHODOLOGY FOR EVALUATING THE CONTENT OF OUTDOOR ADVERTISEMENTS**

### **5.1 Critical Event**

Drivers should retain their focal vision on the road to react as quickly as possible to events occurring in front of them. For the purpose of this study, a critical event is defined as one where the driver of the vehicle has his eyes off the road, looking at an advertisement and an event occur that requires his attention, but he is not focusing on the road and will thus have delayed reaction.

A typical critical event is one where the front vehicle starts braking immediately after the driver of the second following vehicle starts looking at an advertisement. An example calculation is carried out to assess the possible impact.

Assume the 2 vehicles are driving at 120 km/h (33,3 m/s) on a freeway, the traffic on the freeway is dense, but free flow with no regular stop start breakdowns.

Vehicle A: In front, observes incident, start braking at 5 m/s<sup>2</sup> immediately after Vehicle B starts observing an advertisement next to the road.

Vehicle B: Follows certain distance behind Vehicle A, looks at advertisement for 1,5 seconds (relates to reading time of 4 bits), needs reaction time of 1,0 second after looking at road again, thus will start braking 2,5 seconds after Vehicle A.



Using standard movement equations, if Vehicle B was following at less than 16m, a head rear collision will occur.

If Vehicle B looks at the advertisement for 2,6 seconds (reading time for 6 bits), it will only start braking 3,6 seconds after Vehicle A and will require 33 m following distance to prevent a collision.

On South African freeways the following distance between vehicles is anything between 10 and 30m, especially during high flow conditions due to the fact that when leaving to large a gap, another vehicle will change lanes and fill that gap. Based on the above calculations it will then be extremely dangerous to allow a driver to be distracted for anything more than 1,5 seconds. This rather simplistic calculation indicates that 1,5 seconds is in line with all the other literature results and should be used as the design criteria.

To calculate the probability of such a critical event occurring is impossible, as numerous events have to occur simultaneously. It will also be affected by the competency of the driver, reaction time, fitness of the vehicle, weather conditions, traffic volumes and density of traffic, etc. The assumptions made above do however provide a conservative, but realistic scenario to use as design criteria.

### 5.2 Critical Zone

The critical zone is defined as the area in front of an advertisement that starts at the point where the driver can start reading the advertisement. Assuming 1m high text is used, the driver will be able to start reading 500m away (with legibility factor as given before), a total traveling time of 18 seconds in the critical zone at 120 km/h.

Based on the above calculations, the duration of the drivers glances at the advertisement should be limited to 1,5 seconds and based on the reading time formula, that relates to 4 bits of information per glance. Taking into consideration the cone of vision of 15 degrees, the driver should not be reading the advertisement when closer than 150 m from the advertisement, assuming a lateral distance from the lane centre line of 40m.

This leaves 350 m, or 10,5 seconds to read the advertisement. Assuming a full cycle of a glance at the advertisement takes 3 seconds - 1,5 seconds looking away and 1,5 seconds to assess the road ahead, 3 glances can be allowed in this 10,5 seconds. The critical zone is shown graphically Figure 2 below.

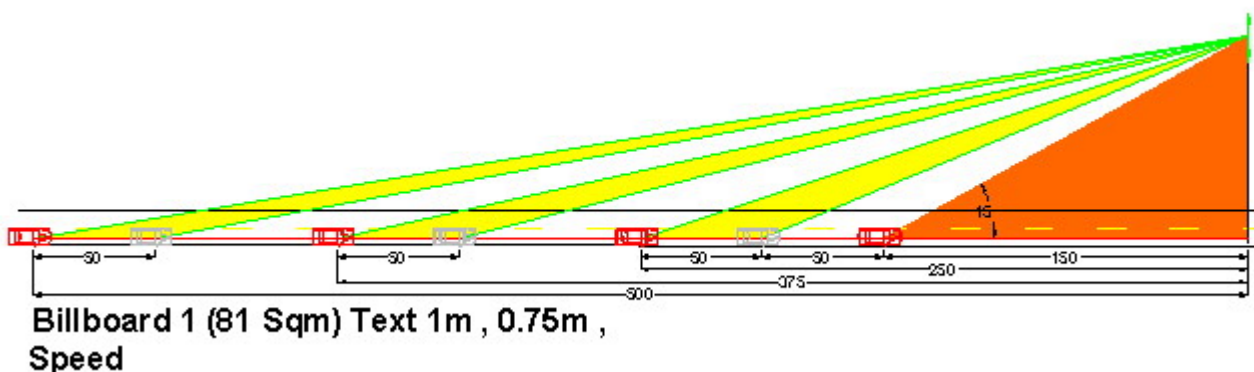


Figure 2. Critical zone - driver's vision 500m in front of advertisement.

The total content or information presented to the driver should then not exceed 12 bits per 500m, as that is the amount that can be read with 3 glances of 1,5 seconds. This is in line with the regulations, as it specifies 2 adjacent advertisements should be 250m apart with maximum 6 bits of information per advertisement, thus 12 bits per 500m.

An evaluation was done of the content on an existing freeway, namely the N1 through Midrand from the Allandale interchange northbound for a distance of 3,5 km. The bits per road sign is shown in Figure 3 and the bits per 500m are summarised in the table below.

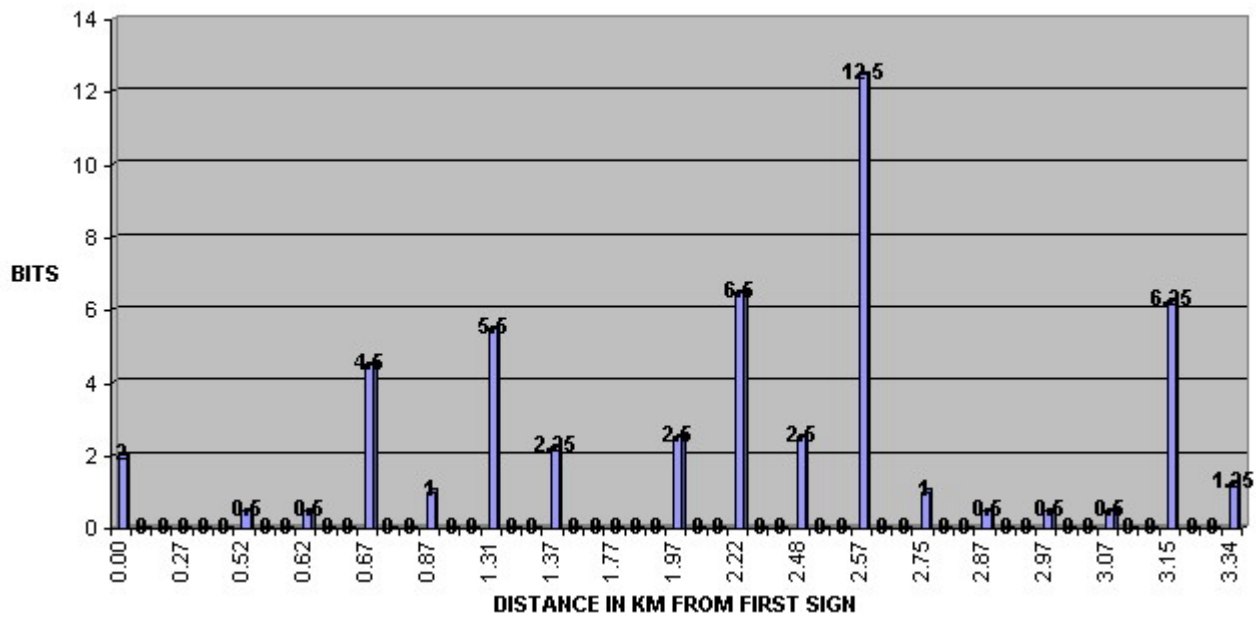


Figure 3. Bits per Road Sign.

Table 2. Existing bits per 500m, N1 North of Allandale Interchange (northbound).

Distance (km)	Bits per 500m (Road signs only)
0,0 - 0,5	2,0
0,5 - 1,0	6,5
1,0 - 1,5	7,75
1,5 - 2,0	2,5
2,0 - 2,5	9,0
2,5 - 3,0	14,5
3,0 - 3,5	8,0

The above table shows that in this case, there are several sections where the road signs, although more than 200 m apart, have high content and this should limit the content on adjacent advertisements. There is only one 500m section with more than 12 bits, which is in front of a complex interchange (New Road). The table also indicates that there are existing 500m sections with low information content where the possibility exists to allow advertisements or additional road signs. It is important to make provision for possible future road signs or to allow advertisements only temporary.

### 5.3 Proposed Rules on content evaluation

Based on the findings of the literature studies outlined in the previous sections and the proposed analytical approach defining the critical zone, the following rules for evaluating the content of outdoor advertisements are proposed:

- The existing regulations should still be applicable. There are a few regulations that will ultimately need adjustment to accommodate the proposed rules. Aspects such as amenity and decency are not addressed in this paper.

- The Regulations do not specify a link between preceding road signs and the content of an advertisement - an advertisement can be preceded by a road sign 200m in front thereof with content well over 6 bits. The 500m in front of the advertisement should be included in the evaluation and the bits in the 500m should be calculated to determine the maximum number of bits on the specific advertisement. A limit of 12 bits per 500 m is proposed.
- The text and logos on the advertisements should be clustered together into groups of 4 bits with similar size. If all the text (more than 4 bits) are the same size, the driver will try and read it one glance and will exceed the 1,5 seconds rule.
- High Attention Advertisements should be classified as any advertisement containing content that will fix the drivers eye for more than 1,5 seconds in one glance. This is difficult to assess, as different persons will view it differently. Relative simplistic tests can however be carried out by displaying the advertisement to a group of people for 1,5 seconds and determining what they have seen.
- Text size should be controlled. Text larger than 1m or smaller than 300mm should not be allowed to ensure that drivers read only in the 500 m in front of the sign and not after entering the 15-degree cone of vision (150m in front of the sign).
- The regulations do not allow telephone numbers with more than 8 digits. Reading time tests revealed that the average person cannot read a 10-digit number in 1,5 seconds. Numbers can be allowed, but the font size should then be minimum 750mm to allow more than one glance to read it.
- Graphics and logos count 2 bits according to the regulations. Familiar graphics and logos can be reduced as the assumption is made that these are read “simultaneously” with the text. Familiar logos include brand names such as “Coca-Cola”, “Vodacom”, “ABSA”, etc. This can be reduced to 0,5 bits.
- The Bit value of short words like “and”, “the” etc. can be reduced to 0,25 bits as they do not take the same reading time as larger words.

Some of the proposals above are made without available scientific proof and are based on logical assumptions. The analytical approach outlined in the previous sections form the basis thereof and additional research in future will be necessary.

## 6. CONCLUSIONS

Using the length of messages (number of bits) on advertisement content as the only quantitative criteria in the evaluation of the sign face, was identified as a problem. This study investigates an analytical approach to evaluate the contents on advertisements, based on the characteristics of the driver. These characteristics include vision, reaction time, reading time, legibility factors, spare capacity to process information and selective attention. Accident statistics were also evaluated to determine the relationship between advertisements and increased accident rates and it was found that in general, advertisements result in higher accident rates.

The proposed rules to evaluate the content for advertisements in the above section will hopefully provide a more practical, defensible approach to evaluate the content.

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## **Biography**

Jan Coetzee founded ITS in February 1997 and has steered the development of ITS to a consulting engineering firm with specialist expertise in various traffic and transportation related fields. He led the transformation of ITS to a black empowered company with majority black shareholding. He is involved in management of ITS, management of projects and new business development. He has been involved in various technical fields including traffic signal optimisation, traffic calming, intelligent transportation systems, outdoor advertising, road safety and road safety audits, access management, public transport facility design, road planning and has done traffic engineering for several large property developments. He has extensive expertise on traffic signals in optimisation of networks, detail design and implementation of traffic signal hardware. He presents the annual course on traffic signal design for the SA Road Federation. He has been involved in major projects where partnerships were formed between authorities and private companies. He delivered several papers at the SA Annual Transportation Convention on traffic calming, traffic signals, road safety and other topics. He was author and co-author of several guideline documents including SA Trip Generation Rates, Access Guidelines for Filling Stations for Tshwane and Traffic Calming. He is a member of the Institute of Transportation Engineers, is a past chairman of the Pretoria Branch of the South African Institution of Civil Engineering (SAICE) and is at present member of the Transportation Division Committee of SAICE. He holds an Honours Degree in Transportation Engineering and a B Eng (Civil) from the University of Pretoria.