Signs and Traffic Safety

The tradition of centuries of generally benign, sometimes non-existent regulatory treatment of signs with respect to type, dimension, size, and location characteristics was dramatically altered by the 1958 National System of Interstate and Defense Highways Act (Interstate Act or "Bonus Act") and its successor, the Highway Beautification Act of 1965 (HBA), as well as its amendments (1974; 1978).

The target of the Bonus Act was outdoor advertising structures (commonly "billboards") located within 660 feet of the rights of way of Interstate highways. A primary purpose for the severe restriction or removal of these structures was to enhance the "defense" aspects of the new system. Specifically exempted from the reaches of the Interstate Act were signs advertising businesses within a 12 mile radius, and signs providing information of interest or necessity to travelers. A state's compliance with the Interstate Act was voluntary; however, if a state chose to comply, the federal government would provide "bonus" funds to partially offset the state's compensation costs for its acquisition of what was described as the "right to advertise" within the controlled areas.

During the seven years the Interstate Act was in force, many states attempted to avoid paying compensation by alleging that the targeted structures were merely "personal property," and that their owners and lessees were not entitled to "taking" compensation. These attempts were routinely rejected by state courts, which generally held that existing structures represented vested real property interests and that, upon removal, payment of compensation (measured as both the fair market value of the sign and the property rights taken) was due to the property owners.

Dissatisfied with the slow pace of billboard removal, and at the urging of President Lyndon Johnson's administration (and his wife, Lady Bird), Congress passed the 1965 Highway Beautification Act (HBA). As its name implies, the primary purpose of the HBA was to "beautify" the Interstate highway system by effectively forcing the removal of all or nearly all illegal outdoor advertising structures within the system's 660-foot rights of way, as well as eventually removing billboards that were previously

Signs which advertise businesses located within a twelve mile radius and signs providing information of interest or necessity to travelers are specifically exempted from the reaches of the 1958 National System of Interstate and Defense Highways Act.

legal but did not conform to the HBA's zoning, height, spacing, or lighting requirements. Gone was the exception for signs advertising businesses within a 12 mile radius, and "bonus" funds were replaced by a penalty of 10% loss in federal highway funding for states unwilling to comply. On-premise signs retained their immunity from enforcement, and still do today, with limited exceptions for "flashing" signs (e.g., signs that blink on-off in rapid succession or change messages or light intensities at several intervals per second).

Not wanting to lose highway funding, but lacking federal financial assistance to pay for removal, many states tried a new compensation-avoidance tactic: outdoor advertising structures were deemed a nuisance *per se*, or nuisance at law. As opposed to a nuisance *per fact*, which requires proof that the subject use or object actually poses a nuisance or hazard, a nuisance *per se* or nuisance at law can be summarily abated without having to pay compensation. Most states espousing this theory as applicable to signs subject to the HBA did not attempt to enforce it literally. Instead, realizing that immediate, non-compensable abatement was perhaps too harsh for previously legal signs, these states extended a short period of "grace" to the newly-offending structures before their removal became mandatory. (The grace period offered in lieu of either compensation or abatement is disingenuously referred to as "amortization".)

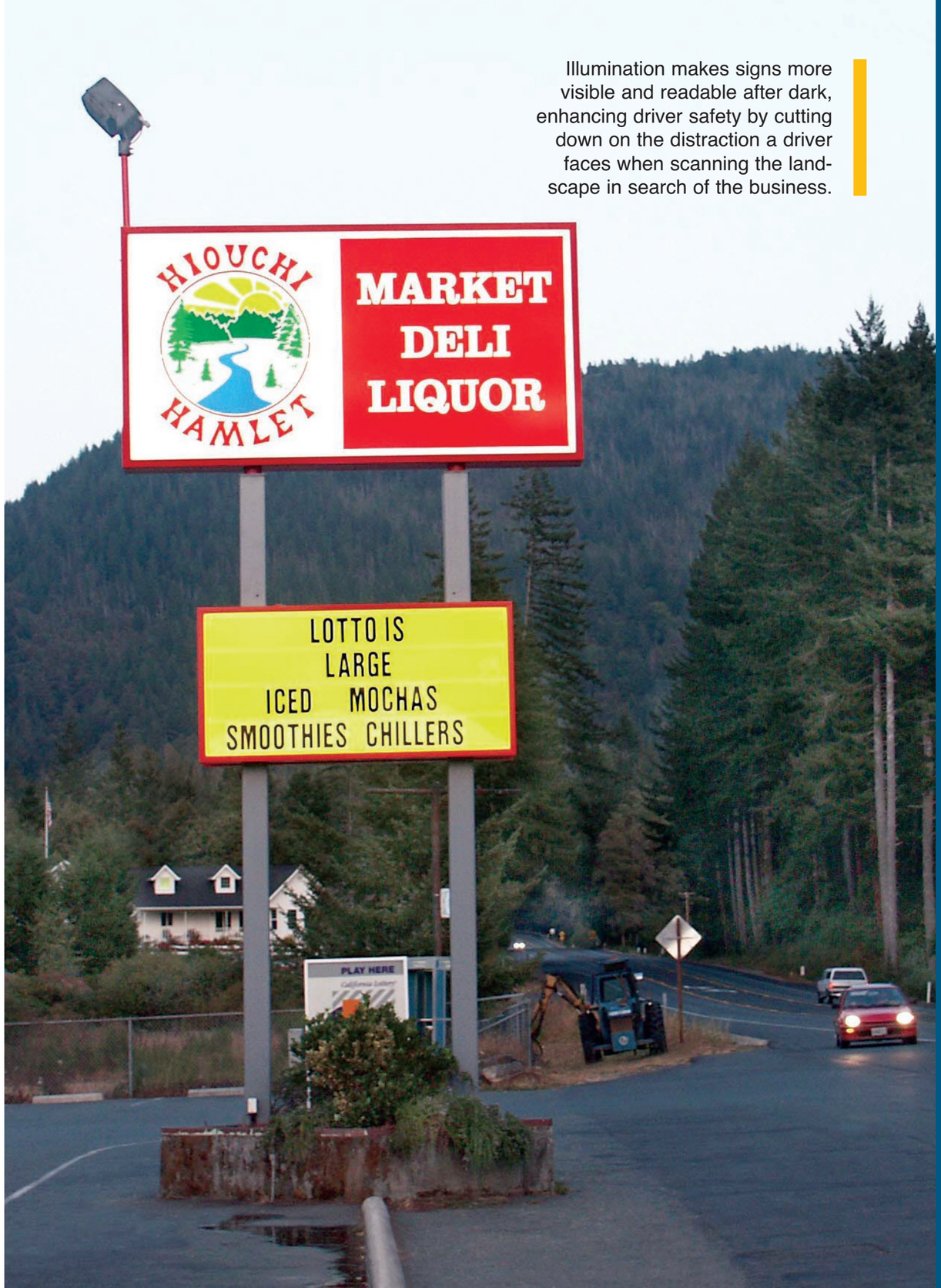
In 1978, Congress reacted to the inequities of nuisance *per se* and amortization. It amended the HBA to read, as it does today: "Just compensation shall be paid upon the removal of any outdoor advertising sign, display, or device lawfully erected under State law and not permitted under [the HBA], *whether or not removed pursuant to or because of [the HBA]*." (Emphasis added.) This amendment, in effect, both forestalled arbitrary nuisance pronouncements by state or local jurisdictions in order to avoid monetary compensation and removed judicial discretion to approve amortization in lieu of compensation.

Denied the nuisance *per se* and amortization theories of compensation avoidance, states were forced to pay compensation for outdoor advertising signs that fell within the confines of the HBA. However, for those outdoor advertising signs not located on Primary and Interstate highways, state and local governments were not similarly restrained from requiring removal for aesthetic reasons without monetary compensation. Although the nuisance *per se* argument, having been thoroughly discredited during the 1978 Congressional hearings, was no longer an option, regulatory authorities still could claim an outdoor advertising sign outside the HBA areas of control was a nuisance *per fact* or require its amortization.

While some states and state courts accepted that amortization was sufficient compensation for the "taking" of outdoor advertising structures on secondary highways and interior urban streets, others rejected the theory out of hand. In these latter states, regulatory authorities were left with the nuisance in fact argument as the sole compensation-avoidance tactic for signs targeted for removal. In this arena, outdoor advertising structures very seldom lent themselves to allegations of dangerous construction or deferred maintenance, leaving "hazard to automobile traffic" as the only peg upon which to hang the nuisance theory. However, try as they would, state and local governments could not prove a nexus between outdoor advertising structures and traffic accidents.

The "Signs-Cause-Traffic Accidents" Debate

Over the last four decades, regulators have advanced two hypotheses proposing that commercial signs compromise traffic safety: (1) commercial signs distract drivers, resulting in more accidents; (2) commercial signs mask the visibility of highway signs, resulting in more accidents. These notions have been rejected time and time again by the Federal Highway Administration and Congress when they have been proposed as reasons to deny just compensation for the removal of outdoor advertising structures as mandated by the federal Highway Acts.



Illumination makes signs more visible and readable after dark, enhancing driver safety by cutting down on the distraction a driver faces when scanning the landscape in search of the business.

The hypothesis that private signage causes traffic accidents by distracting drivers, or "overloading" them with information, has never been supported by any direct evidence. David M. Baldwin, Executive Secretary of the Institute of Traffic Engineers, made the seminal statement on this issue 45 years ago.

In pertinent part, Mr. Baldwin said:

Pending legislation [the "National System of Interstate and Defense Highways Act"]...has focused attention on the question of roadside advertising or billboards...[and attempts] to identify a relationship between accidents and billboards. [T]he traffic engineer has been asked to take sides – on the basis of the safety aspects of the problem. Facts are notably few and far between, but those that do exist indicate no significant relationship between outdoor advertising and the occurrence of traffic accidents....[a]ttempts by opponents of outdoor advertising to assume such a relationship are unfair and are not condoned by engineers, who will insist on seeing evidence of any such relationship...

[[T]raffic engineers'] reasons for opposing billboards, if this is their position, are those of aesthetics or personal opinion ... not because there are facts about accidents ... [T]he opponents of billboards have tied their case to the coat-tails of safety. This misleading identification has been confusing to the general public ... [L]et's spike the attempts to blame accidents on billboards and to promote anti-billboard legislation "on the basis of its effect on safety" (ital). Let's be for or against billboards as we will – but let's admit that it is on the basis of our own likes and dislikes, our own opinions and interests. As engineers who preach a factual approach to all our problems, we can adopt no other attitude toward this one.[1]

Signs enhance safety by "waking up" drivers when their alertness may be lagging.

More recent examples addressing the signs-cause-traffic-accidents argument are provided by the American courts, beginning with *Metromedia Inc v. City of San Diego*.[2] In the late 1970's, San Diego undertook a sign code revision that would, among other things, authorize the city to ban outdoor advertising structures throughout the city and on all Interstate and Secondary highways. The primary reasons advanced by the city for its ban were (1) the structures significantly degraded the attractiveness of the community, and (2) the structures compromised traffic safety. The ban included the display of both commercial and noncommercial speech, and payment for removal of existing structures was to be accomplished through amortization.

"Let's be for or against billboards as we will - but let's admit that it is on the basis of our own likes and dislikes, our own opinions and interests. As engineers who preach a factual approach to all our problems, we can adopt no other attitude toward this one."

- David M. Baldwin
former Executive Secretary
Institute of Traffic Engineers

No state or local government has ever been able to prove a nexus between outdoor advertising structures and traffic accidents.

Although originally brought by a major outdoor advertiser to protest the use of amortization as "just" compensation, the case was multi-faceted, and by its conclusion had morphed into an analysis of the impact of the code on First Amendment rights, which turned on the constitutionality of an ordinance that permitted on-premise signs to display commercial or noncommercial messages but forbade the display of noncommercial messages on off-premise signs. The final resolution produced a plurality decision consisting of five separate opinions.

While none of the five opinions garnered a majority of the Court's members, the justices could agree on some points.

First, the Court was unanimous in finding that a community could ban off-premise commercial signs, but still permit on-premise commercial signs as a legitimate exercise of police powers to reduce sign clutter (or improve "aesthetics") and promote traffic safety.

Next, seven justices agreed that, based on the *Central Hudson* test, the city's interest in promoting traffic safety and avoiding visual clutter was substantial enough to justify a complete prohibition of off-premise commercial signs.

Finally, although the Court ruled 6-3 that the city's sign ordinance was unconstitutional, the six judges couldn't agree why. Two justices simply found that the ordinance failed the *Central Hudson* test because the city had not conclusively shown that the city's interest in aesthetics and traffic safety was substantial enough to justify a prohibition of signs in commercial and industrial areas. The other four justices joined in a plurality opinion that found two flaws: (1) the ordinance favored commercial over noncommercial speech because commercial speech could be displayed on on-premise signs while noncommercial speech could not; and (2) the ordinance discriminated among various noncommercial messages by creating exceptions for some, but not all such messages.

Justice White summed up his opinion by stating:

"It is apparent ... that the ordinance distinguishes in several ways between permissible and impermissible signs at a particular location by reference to their content. Whether or not these distinctions are themselves

1. See, *Traffic Engineering 27*; April 1957; 311.
2. 453 U.S. 490 (1981).

constitutional, they take the regulation out of the domain of [content neutral] time, place and manner restrictions."

Justice White further directly addressed the traffic safety issue by stating that the record was inadequate to show any connection between "billboards" and traffic safety, and therefore, the ban did not directly advance the city's interests in traffic safety.[3]

While the plurality opinion confirms that promotion of traffic safety could be a legitimate exercise of police powers, the Court did not address whether or not a factual basis existed for a traffic safety claim in the specifics of *Metromedia*. This was because all the litigants stipulated, and the Court so accepted, that there was no positive correlation between private signs and traffic accidents. As a result, traffic safety, in a negative sense, ceased to be a factor in the case.[4] The City of San Diego, in accordance with *Central Hudson*, had attempted to develop factual proof to support its assertion that the signs were a detriment to traffic safety, but had been unable to do so.

With respect to the amortization issue that began the lawsuit, it was essentially moot by the time the case reached the Supreme Court. The irrelevancy occurred for two reasons:

1. The 1978 HBA amendment had rejected amortization as meeting the requirements of just compensation.
2. The parties had stipulated that a traffic safety issue was not present, therefore, a "nuisance" argument for avoiding just compensation was without merit.

As a result, the Court did not hesitate to direct the city that once it had corrected the constitutional infirmities of its ordinance and could achieve a legitimate ban, removal or relocation of off-premise sign structures, it was to pay affected property owners cash compensation based on federal law and appraisal methods and schedules.[5] The only exception for cash compensation would be for targeted structures the city could

San Diego's code was overturned in part for prohibiting on-premise display of non-commercial signage while at the same time allowing commercial speech in those locations.

Commercial signs may actually aid in traffic safety by guiding drivers to their desired destination. In order to achieve this, however, the signs must be visible and readable.

prove were hazards to traffic safety.[6]

Based on voluminous amounts of research, and with or without party stipulation, the *Metromedia* "traffic safety" result has manifested itself in case after case involving the ban of outdoor advertising structures: traffic accident prevention is not a valid reason to prohibit outdoor advertising structures.

As an on-premise signage corollary to the outdoor advertising lawsuits, a recent extensive search of the Westlaw database for all state and federal cases was undertaken by a nationally prominent law professor. The search disclosed that not a single reported case ruled that an on-premise sign was a primary cause of a traffic accident.

Many traffic engineers believe that the deficiency hypothesis serves the public interest better than a hypothesis proposing that commercial signs, by their very existence, cause accidents. This view is predicated on the proposition that commercial signs have a positive effect on traffic safety, provided they are sufficiently legible and readable, adequately contrast with their background, and are in a good state of repair. If these attributes are missing, a sign is likely to be deficient. When "signage deficiency" is created, the probable result is an increase in unsafe driver behavior and, in turn, more traffic accidents. This view is further supported in a recent study by Richard N. Schwab, a former Federal Highway Administration program manager for research on highway visibility and night driving safety. He wrote:

Traffic safety is not jeopardized by the sign itself or some sort of stimulus overload; instead the culprit is inadequate sign size or lighting, or inappropri-

3. *Id.* at 508.
4. The Supreme Court's acceptance into the record of the parties' stipulation that there was no credible proof of a nexus between the mere presence of signs and traffic accidents, together with Justice White's remarks on the subject, exhibit a rebuff, albeit indirect, of not only the California Supreme Court's prior rejection of said stipulation, but also its holding that, as a "matter of **law**", an ordinance prohibiting billboards relates to traffic safety.
5. The San Diego sign code, as amended in 2002, specifically prohibits amortization of all lawfully erected signs - both on-premise and off-premise - except in very limited circumstances. The code further prohibits amortization in any case in which its application would result in a loss of federal highway funds by the State.
6. A last-ditch effort was made by the California Transportation Authority to "take" outdoor advertising structures and their "sites" without just compensation by alleging that such signs not only degraded visual aesthetics but also the real property value of both its site and those of its neighbors. This allegation was soundly defeated by the appraisal firm Haskell Berry, which conclusively showed that such structures either had no effect on subject property values or in some cases actually enhanced said values.

ate placement, or a combination of these factors.[7]

The "Signs-Promote-Traffic-Safety" Debate

If the argument that signs are intrusive and dangerously distracting is not supported by any currently credible research, is there any currently credible research supporting the opposite? It is difficult, if not impossible to prove the negative (e.g., private on-premise or outdoor advertising signs do not cause car crashes). Nonetheless, research[8] has disclosed that the average human brain has a remarkable ability to discard whatever is irrelevant to the immediate driving objective or task. In other words, if a sign is not especially pertinent to a driver's needs or interests, it will generally be ignored. Certainly, the sign will have no affect on the driver's ability to maintain speed, stay within the correct lane or avoid an unsafe maneuver or traffic infraction.[9] An objective analysis of one's own driving behavior will bear this out.

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Every driver at one time or another has experienced the alarm of arriving at a point in the road with no present recollection of getting there. Obviously, when this occurs, one has not been distracted along the way by signs, but instead has almost sub-consciously performed driving tasks without paying too much attention to anything. This phenomenon is described by many researchers as "highway hypnosis," and occurs often on monotonous streets and highways. Interestingly, researchers have concluded that well-designed and strategically placed signs may actually improve traffic safety on such roads because they "wake up" drivers, or direct their attention to the surroundings when alertness may be lagging.[10] This same knowledge has prompted highway engineers for years to intentionally design curves and elevation changes into roadway plans rather than to follow a straight line from one city to the next.

Support for the theory that signs may promote traffic safety is also found in a study conducted by the FHWA which concluded that commercial high-rise signs located at high traffic volume intersections enhanced traffic safety, provided they met federal highway signing minimal standards for legibility, readability and conspicuity (or contrast with background).[11]

At the opposite end of the research spectrum, there is evidence (Gittings) that information deficiencies at points where drivers need or want it may increase the likelihood of accidents.[12] A signage information deficiency exists when requisite information is not there at all, or is not visible enough to be detected, read and understood in time to react safely, or is not located within the "cone of vision" – that area in which a driver has a generally clear view of objects in and around the roadway. See Figure 1.

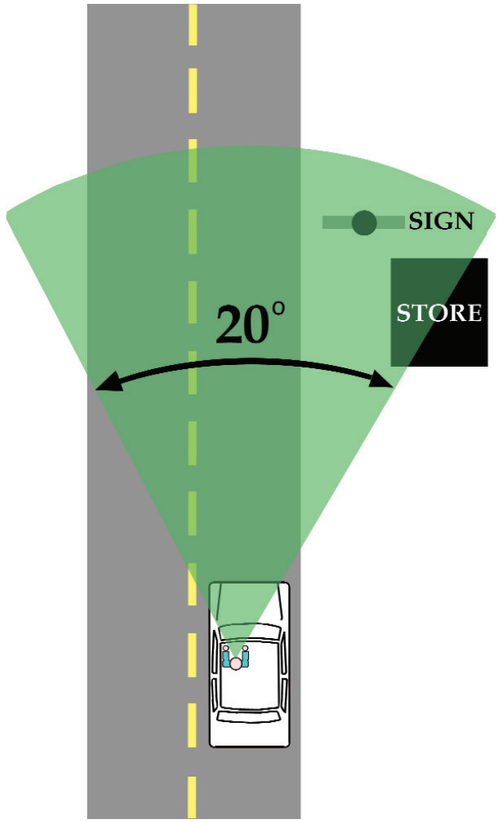


FIGURE 1

The Gittings' study of tort claims filed against the Pennsylvania Department of Transportation found that 22% of the lawsuits arising from highway accidents (on both interstate and intrastate systems) alleged signage deficiency as either a contributory or primary cause of the accident. Another study undertaken by the FHWA not only found that commercial signs did not adversely affect safety, but also that signing deficiency was the second leading cause of serious accidents on the Interstate Highway System. This is precisely why the agency does not allow highway signage below certain sizes.

The Distracted Driver

From the late 1960s through the 1970s, some states were claiming, pursuant to the Highway Beautification Act, that outdoor advertising structures (or "billboards") were so distracting to drivers that they posed a traffic safety hazard and, therefore, could be removed either summarily (by abatement) or within a very short period of time (amortization in lieu of compensation). Outdoor advertisers and their clients challenged those

A recent review of all state and federal court cases discovered not one case in which an on-premise sign was ruled to have caused a traffic accident.

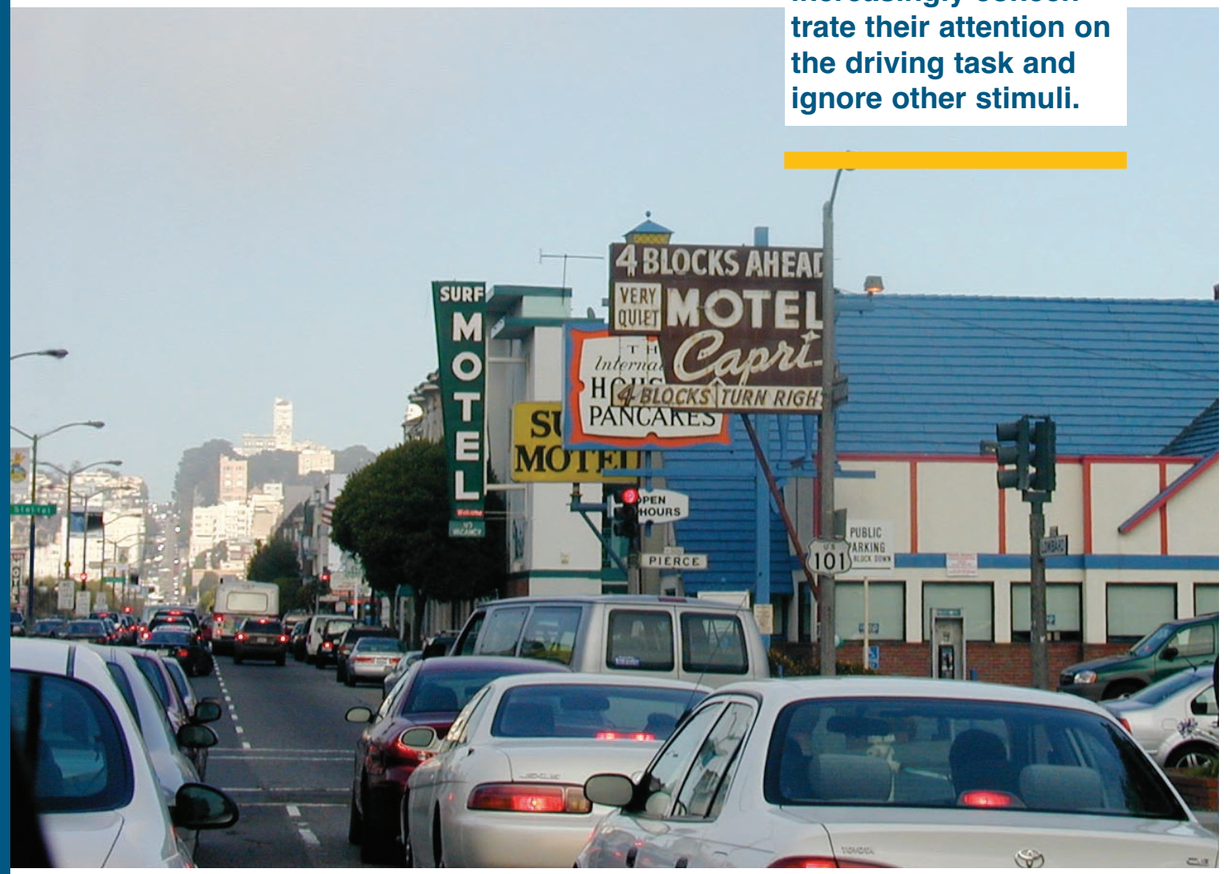
7. Excerpt from a study by Richard N. Schwab entitled *Safety and Human Factors: Design Considerations for On-Premise Commercial Signs*, cosponsored and published by The Signage Foundation for Communication Excellence Inc. and the International Sign Association (1998).
8. Wachtel, Jerry and Netherton, Ross, *Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage*, Report No. FHWA/RD-80/051, Federal Highway Administration, Washington, DC, June 1980; Johnston, A.W. and Cole, B.L. "Investigations of Distraction by Irrelevant Information," *Australian Road Research*, Vol. No. 3, pp. 3-23, 1976; Mace, D.M., Garvey, P.M. & Heckard, R.F. 1994. *Relative visibility of increased legend size vs. brighter materials for traffic signs.* Publication No. FHWA-RD-94-035.
9. Most drivers can seek and process vast amounts of information, and filter out all but what is needed, in milliseconds. Additionally, drivers' sampling of signage displays containing information unrelated to the driving task or traffic environment must be sound, or there would be more accidents in the vicinity of advertising signs. *See* A.W. Johnston and B.L. Cole.
10. *e.g.*, Prince, J.A., Professor of Ophthalmology, Oio State University.
11. *See, Analysis and Modeling of Relationships Between Accidents and the Geometric and Traffic Characteristics of the Interstate System*; Cirillo, Dietz and Beatty; U.S. Government Printing Office, Federal Highway Administration, Washington, DC; August 1969, reprinted 1976.
12. *See, Pennsylvania Tort Claims Study*; Gittings, 1985.
13. Cirillo, Dietz and Beatty; U.S. Government Printing Office, Federal Highway Administration, Washington, DC; August 1969, reprinted 1976.

states attempts to avoid paying just compensation for the removal of outdoor advertising structures on a "nuisance" theory. One such battle was waged in the United States District Court for the District of Maine, Southern Division.[14]

In this case, the plaintiff outdoor advertising company submitted a "Master Affidavit of Facts" in support of its contention that billboards were neither dangerously distracting nor a causal factor in car crashes. The affidavit set out numerous studies that concluded there is no relationship between traffic accidents and roadside advertising signs – either on-premise or off-premise (billboards). One study analyzing traffic accidents in Denver, Colorado, specifically addressed "inattention," "obscured vision" and "other causes" (accidents with specific causes, such as speeding or defective brakes, were not examined). Of the 13,400 accidents investigated for the years 1972 and 1973, "inattention" accounted for 1,467, "vision obscured" for 5,386, and "other causes" for 6,583.

Each of the approximate 13,400 subject accident reports was carefully read for mention of signs, billboards, or visual advertising of any sort as a cause of the accident. While numerous causes were cited, some of them quite unusual (e.g., watching girls on the side of the road, looking at an apartment building, a revolver fell off the front seat and discharged, a bee flew in the window, a lit cigarette dropped on the floor) only eleven indicated signs as a cause. Of these, eight accidents reportedly were caused when people were looking for or at **a city street sign – "public" signage**.[15] The remaining three accidents were caused by (1) a road construction sign – another "public sign" – improperly placed in a lane of traffic, (2) a 10-square foot on-premise sign that was so low (per the sign code) it blocked the vision of a motorist leaving an alley, and (3) a motorist driving to the wrong side of the road to obtain information from a real estate "for sale" sign (inappropriate driver behavior resulting from a sign that was not readable). Following the accident-report review, the locations of all "inattention" accidents were plotted on overlay maps that also contained billboard locations. There was no statistical relationship between those accidents and the billboards.[16]

When the difficulty of the driving task increases, drivers increasingly concentrate their attention on the driving task and ignore other stimuli.



A Denver study found no link between accidents caused by "inattention" and billboards.

In 1971, the Miami University Faculty Research Committee commissioned a study by professors of psychology Drs. Bruce J. Morrison and Marvin J. Dainoff. The study, entitled *Eye Movement Characteristics in Recall of Incidentally Presented Stimuli When Attention is Divided*, involved a simulated driving task, in both heavy and light traffic conditions, with photographic slides on both sides of the "vehicle" depicting urban and rural landscapes, which included advertising signs. An eye movement recorder was used to show what the test subject was seeing and exactly where the subject's eyes were focusing at all times during the 30-40 minutes of "driving." Although the purpose of the study essentially was to test recall in situations that may divide attention, its methodology and results clearly demonstrated that the presence of advertising signs created no adverse effect on driving. In fact, the Miami study confirms the results of other studies: When the difficulty of the driving task increases, drivers increasingly concentrate their attention on the driving task and ignore other stimuli, including roadside advertising signage.[17]

Until the year 2001, the last in-depth crash causation research was sponsored by the National Highway Traffic Safety Administration (NHTSA) and conducted at Indiana University in the late 1970s.[18] In this study, driver inattention was cited as a causal factor in 24% of the crashes investigated. Driver distraction, a form of inattention, accounted for 9% of this figure.[19]

Today, the NHTSA describes distraction as occurring when a driver "is delayed in the recognition of information needed to safely accomplish the driving task because some event, activity, object, or person **within or outside** the vehicle compels or induces the driver's shifting attention away from the driving task." Thus, the presence of a triggering event distinguishes a distracted driver from one who is simply inattentive or "lost in thought."

Realizing the need for updated research, the AAA Foundation for Traffic Safety commissioned the University of North Carolina Highway Safety Research Center to conduct a new study that focused on the approximate 284,000 serious "distracted-driver" car crashes that occurred each year during the years 1995 to 1999. The goal of the project

14. John Donnely & Sons, et al v. Roger L. Mallar, 453 F.Supp. 1272 (1978) [Civil No. 77-284-SD].
15. *See*, Chrysler, S., et al, 2001. *Improving Street Name Sign Legibility for Older Drivers*. Proceedings of the Human Factors and Ergonomics Society 45th Annual Meeting, pp. 1597-1601.
16. Virtually identical studies were conducted throughout the 1970s in Texas, Maryland, New Mexico, Florida, and North Carolina with virtually the same result: There is no statistical relationship between the location of billboards or other advertising signs and traffic accidents. The same conclusion was reached in the Netherton-Wachtel study of variable electronic message centers, as well as stipulated to by the litigating parties in Metromedia v. City of San Diego, *supra.*
17. *See,* Johnston, A.W. and Cole, B.L. 1976. "Investigations of Distraction by Irrelevant Information." *Australian Road Research 6*, no. 3:3-23, *supra*.
18. Treat, J.R.; Tumbas, N.S.; McDonald, S.T.; Shinar, D.; Hume, R.D.; Mayer, R.E.; Stansifer, R.L.; Castellan, N.J. (1979) *Tri-Level Study of the Causes of Traffic Accidents: Final Report*. Bloomington, ID: Institute for Research in Public Safety. [Report No. DOT-HS-034-3-535-79-TAC(S)].
19. The Indiana team analyzed distractions occurring inside the vehicle only; no information was reported on the frequency of external distractions.

was to identify the major sources of distraction to drivers, and the relative importance of the distractions as potential causes of crashes. Data from the NHTSA's NASS Crashworthiness Data System (CDS) and the University of North Carolina Highway Safety Research Center was analyzed. Taking into account only those drivers whose attention status was known – from police reports – at the time of the accident, the research team determined that the percentage of drivers identified as distracted, rather than inattentive, was nearly 13%.[20]

The CDS separates driver attention status into five categories:

1. Attentive
2. Distracted
3. Looked but didn't see
4. Sleepy or fell asleep
5. Unknown or no driver

"Distracted" drivers were grouped into 13 subcategories. These categories were analyzed by the North Carolina research team in the order of frequency in which they were reported as distracting activities that led to a serious crash (see Figure 2).

FIGURE 2

Specific Distraction	% of Drivers
Outside person, object, or event	29.4%
Adjusting radio/cassette/CD	11.4%
Other occupant	10.9%
Moving object in vehicle	4.3%
Other device/object	2.9%
Adjusting vehicle/climate controls	2.8%
Eating and/or drinking	1.7%
Using/dialing cell phone	1.5%
Smoking related	0.9%
Other distractions	25.6%
Unknown distraction	8.6%

These categories included the following additional descriptions:

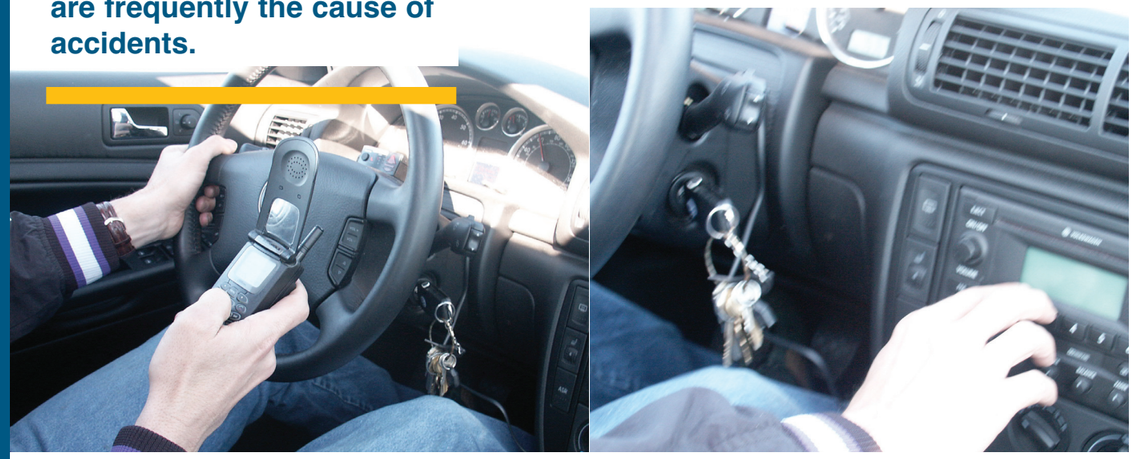
Outside objects, persons, or events included other vehicles, other drivers, emergency vehicles, police cars, animals, children or others in the roadway, pedestrians and bicyclists, crash scenes, and road construction.

Adjusting the radio was specified more often than adjusting a tape or CD player.

Moving objects in vehicle included dogs, bees, "bugs" or "insects," and falling or spilled objects, such as drinks or groceries.

Other devices brought into the vehicle that distracted drivers included objects that fell onto the floor and/or off the seat of the vehicle, such as cassette tapes, water bottles, purses, etc., and also actions, such as reaching for objects or rolling down a window.

Driver distractions such as using a cell phone or adjusting the radio, cassette player, or CD player are frequently the cause of accidents.



A driver who is straining to read a small sign while searching for a particular destination may become distracted from the primary driving task.

Adjusting vehicle/climate controls generally referred to equipment such as mirrors, lights, or windshield wipers, or was left unspecified.

Eating and/or drinking was generally not clarified, although some reports identified the specific beverage or food involved.

Cell phone was only differentiated according to answering a ringing phone and "other."

Smoking distractions were all attributed to cigarettes, and included about equal numbers of searching for a cigarette, lighting it, dropping it, or having it blow back into the vehicle when trying to dispose of it outside.

The broad category of **"other"** distraction included medical problems (loss of consciousness, etc.), searching for something outside the vehicle (street signs, parking place, etc.), looking or reaching for something inside the vehicle (map, pen, wallet, etc.), and a broad range of "other" events too specific to categorize (sneezing, sun glare, etc.).

Small street signs can be hard to see, and as drivers strain to read them they may become distracted. This can result in a traffic accident.

The research showed that drivers under age 20 are more likely than older drivers to be identified as distracted at the time of their crash: 11.7%, compared to 8.0% or fewer for each of the other age groups (20-29, 30-49, 50-64, 65+). When the "unknown" cases were subtracted from the totals, the percentage of young drivers under 20 identified as distracted climbed to 17.3%. Furthermore, certain types of distractions were more prominent in certain age groups: adjusting the radio/cassette/CD among the under 20-year-olds; other occupants, especially young children, among 20-29 year-olds; cell phone use among 30-49 year-olds; eating and drinking among 50-64 year-olds; and outside objects and events, as well as "other distractions," among those aged 65 and over.

20. Stutts, Jane C.; Reinfurt, Donald W.; Stapline, Loren; Rodgman, Eric A. 2001. University of North Carolina Highway Safety Research, Chapel Hill, NC; *Distracted Drivers*. AAA Foundation for Traffic Safety.

Variations by gender were less pronounced, with males showing a slightly higher overall proportion of distraction cases.

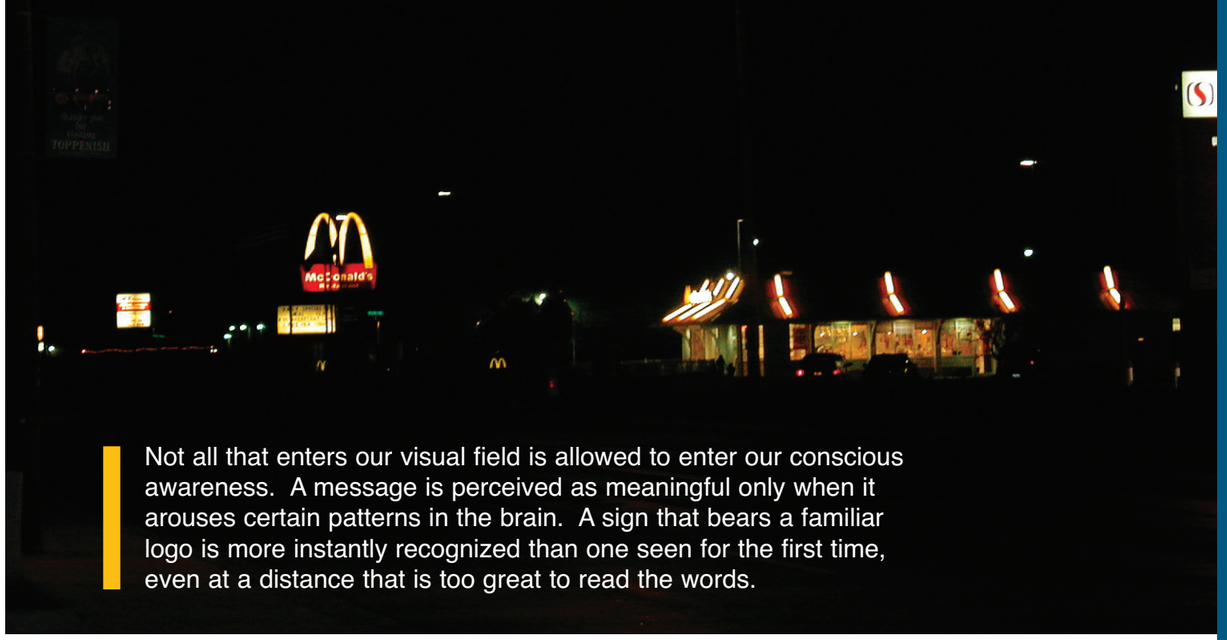
The study results clearly demonstrated that (1) distraction is a problem for drivers of all ages and both sexes, and (2) the specific sources of distraction vary considerably, and include a combination of old and new events. Some of the "old" distractions that continue to cause problems are children and babies, cigarettes, drinks, radios and tape players, and insects or bugs that enter the vehicle. "Newer" distractions include CD's, pagers, and cell phones.

Most importantly, for our purposes, the data reviewed disclosed that some objects – such as CB radios, temperature controls and billboards or other roadside advertising structures – were not significant distractions. This finding is in keeping with previous highway research spanning nearly 50 years.

And, while the study found that the proportion of distracted drivers was fairly consistent (8.0%) for all age groups above the youngest, in contrast, the oldest groups of drivers, those age 65 and above, stood out with regard to the two other forms of driver inattention: "looked but didn't see" and "sleepy or fell asleep." Drivers age 65 and older were 3-4 times more likely to have "looked but didn't see" but only half as likely to have been sleepy or asleep prior to crashing. One reasonable conclusion to draw from this finding is that older drivers require larger signs across the board if they are to improve their detection of roadway and roadside objects and appropriately respond without endangering their safety and the safety of others.[21]

Eye-Brain Relationship

Regulators tend to rely on their own "common sense" deduction that private signage proliferation is distracting, and therefore must be hazardous to traffic safety, but science and common experience tell us just the opposite. How can this be? To answer this question requires some knowledge of how the eye functions and how the brain receives and processes information the eye has given it.



Not all that enters our visual field is allowed to enter our conscious awareness. A message is perceived as meaningful only when it arouses certain patterns in the brain. A sign that bears a familiar logo is more instantly recognized than one seen for the first time, even at a distance that is too great to read the words.

The eye sees, but the brain perceives. This is an important distinction. Not all that enters our visual field is allowed to enter our conscious awareness. A message is perceived as meaningful only when it arouses certain patterns in the brain.

Our eye sees many things, which are not registered in our conscious mind. For example, familiar patterns are "encoded" more rapidly than new configurations, thus a sign that bears a familiar logo is more instantly recognized than one seen for the first time. Still, it may be ignored by the brain because the attention is being directed to something which has taken on a higher personal priority. The conscious and unconscious human mind in dynamic combination readily process hundreds of simultaneous sensory inputs, sorting out unneeded visual stimulants.

Contrary to popular belief (or "common sense"), it is very difficult, if not impossible, under the normal circumstances of daily activities to "overload" the mind's information processing capacities. Due to its sensory gauging capabilities, the brain simply will not allow too much information to "blow its circuits," nor will a driver normally be distracted from primary driving tasks by commercial signage presented in the cone of vision; this is particularly true under high traffic or high speed circumstances.

The Eye as a Scanner

Many people assume that the eye functions in much the same way as a camera, taking in static scenes. In fact, if the eye is to be compared to any instrument, it should be compared to radar. Like radar, it scans the environment, continuously charting what it sees around it. While this analogy to radar has some weaknesses, it is far more appropriate than the notion that the eye is similar to a camera.[23]

The above does not mean to say that the eye never fixes on one spot. It may be fixed to comprehend a group of letters or words. According to Griffin, et al (1997), a fixational pause lasts about 1/5 to 1/4 second (or 200-250 milliseconds). Word identi-

The Distraction Factor

The information conveyed by an on-premise sign may simultaneously be specific to one driver's immediate needs and largely irrelevant to another's. However, most drivers can seek and process vast amounts of information — and filter out all but what is needed, in very rapid succession.

Although highly distracting, irrelevant information on advertising signs can produce a statistically significant decrease in tracking or detection tasks, research on the distraction factor discloses that the decrease is so small, it has no practical impact on driving functions. More specifically, test results have disclosed the following:

1. Drivers look directly at the messages displayed and, usually within milliseconds, are able to collect the information sought or needed, provided the signs are easy to read and understand. This is so, even in the presence of competing messages nearby.
2. The more complex the driving situation, the more easily the sign should be seen and read. This is particularly true for freeway interchanges, where the driver is often required or needs to make split-second decisions.
3. Proper sign lighting or illumination enhances a sign's readability and, thus, a driver's safe-reaction times. A positive side effect of legible, well-placed, and illuminated signs is the decrease in time that the driver is looking away from the road.[22]

21. For more information contact Emily Smith at the UNC Highway Safety Research Center at (916) 962-7803 or Stephanie Faul at the AAA Foundation for Traffic Safety at (101) 638-5944, ext. 4. Also see the UNC Highway Safety Research Center website at http://www.hsrc.unc.edu/ and the AAA Foundation for Traffic Safety website at http://www.aaafoundation.org.
22. Schwab, *supra*.
23. Johansson, Gunnar. "Visual Motor Perception." *Scientific American*, Vo. 232, No. 6, June 1975.

fication with each fixation can include a range of 6 to 19 characters (letters and spaces). Motorists usually limit fixation times to 2 seconds and rely on multiple eye movements for driving safety purposes.[24]

Great caution must be exercised, however, when converting laboratory experimentation into public policy, particularly where it pertains to issues of speech. The number of items and complexity of those items processed by the human mind during a short 1/5 second scan depends entirely on the viewer's past experiences and ability to recognize patterns of letters as single, identifiable pieces of information. Furthermore, highway signage research has demonstrated that symbolic traffic signs generally have superior recognition distance when compared with a same-size sign containing a word message.

In traffic signing, the stop sign

FIGURE 3

is a typical symbol sign. Robinson (1967) reported a study in which driver recognition was tested by replacing a stop sign containing the word "stop" with a standard stop sign containing the word "tops." Drivers continued to stop, and when questioned, 87 percent reported they had failed to notice anything unusual about the sign. The drivers paid attention to color and shape, and did not see – or read – the message.[25] (See Figure 3)

The same holds true for on-premise business signage that emphasizes corporate trademarks or logos – the equivalent of the "symbolic" highway sign. The colors and/or distinctive shapes of corporate signage provide legibility and conspicuity at far greater distances than would otherwise be possible with standard sign faces containing nothing but lettered copy. And they do not have to be read to be understood.

Figure 4 clearly illustrates this phenomenon. Both have the same number of characters, but the sign on the right contains words of such familiarity, written in a trademark font and placed on a background of a trademark color, that they can be comprehended in a fraction of a second. It is easy to see, then, how limits on the number of characters can discriminate against "mom and pop" and favor corporations, chains and franchises, which benefit from

FIGURE 4

The colors and/or distinctive shapes of corporate signage provide legibility and conspicuity at far greater distances, even with visual competition from more exciting signs.

national advertising campaigns and high levels of logo familiarity.

Another factor to consider is the sign's appeal to the repeat viewer. A motorist will typically spend 95% of driving time on arterials, which comprise fewer than 20% of the country's roads. The motorist becomes very familiar with the signs located on these collector arterials. The challenge the sign designer faces in reaching the 80% of the population who live or work in the trade area is not in having them read the top word, or the key word, or 19 characters, or 7 "bits" or "chunks" of information. The challenge is in making sure that after being seen repeatedly, the sign is still interesting enough to be remembered.

The Brain as a Selector

As pointed out by Johnston and Cole (1976),[26] signs – even several signs within a short distance – do not cause us to crash into the vehicle ahead of us or to drive off the road. This is so because the normal human brain has a remarkable ability to process visual input, recognizing even highly complex items, such as the movement of vehicles and pedestrians on a crowded road, buildings, landscaping, signs, and more as single inputs, making rapid decisions and selectively choosing items of importance requiring more attention, while rejecting others.

Engel (1977)[27] distinguished between sensory or pure visual prominence and cognitive recognition, which involves the meaning or relevance of a visual object, plus the psychological

24. Griffin, J.R.; Christenson, G.N.; Wesson, M.D.; Erickson, G.B. *Optometric Management of Reading Dysfunction*. Boston: Butterworth-Heinemann, 1997.
25. Schwab, Richard N. 1998. *Safety and Human Factors: Design Considerations for On-Premise Commercial Signs.* International Sign Association, Washington, DC; referencing Robinson, Carlton C. "Color in Traffic Control," *Traffic Engineering*, May, 1967.
26. Johnston, A.W.; Cole, B.L. *Investigations of Distraction by Irrelevant Information*. Australian Road Research, 1976; 6:3-23.
27. Engle, F.L. *Visual Conspicuity, Visual Search and Fixation Tendencies of the Eye.* Vision Research, 1977; 17:95-108.

state of the driver. According to this idea, the motivation of a driver and the relationship between a sign and its surrounding background cannot be separated.

In general, the likelihood of an object being noticed or perceived by the brain is a function of several factors, sometimes referred to as "figure-ground" factors:

- The physical characteristics of the object and its background
- The information content of the object
- The information needs of the observer (e.g., safety, direction, identification)
- The motivation of the observer (e.g., food, gas, lodging)
- The observational history of the observer (e.g., familiarity with visual symbols such as McDonalds golden arches)
- The observational strategy and expectations of the observer (e.g., random scanning of locations where subject sign is expected)

The challenge the sign designer faces is not in enticing people to read the top word, or the key word, or 19 characters, or 7 "bits" or "chunks" of information. The challenge is in making sure that after repeated viewing, the sign is still interesting.

While perceptual and cognitive speed are also factors in ground-figure recognition, most drivers have the ability to rapidly separate figure from ground. Research shows that the more familiar an object or figure is to the driver, the fewer fixations he or she will require to recognize it, thereby reducing recognition time. In situations where a driver may become distracted by too much information in the visual field, the average driver will be able to quickly attend to the figure required to meet his or her immediate needs – a directional sign, a merging car – and ignore the rest of the field, which becomes mere "background."

To be noticed, a sign needs to contrast with its background.

Electronic Message Centers and Traffic Safety

Some argue that Electronic Message Centers (EMCs) will cause traffic accidents by distracting the driver, but this has never proven to be the case. The variable electronic message center – like other types of signage – when properly designed, placed, maintained, and illuminated does not cause traffic accidents, and may in fact prevent them because of its superior legibility, readability and conspicuity.

Local banks were the first users of EMCs, displaying the time and temperature signs with which everyone is familiar. Today, private usage of EMCs is dramatically exhibited in sports stadiums, gaming centers, and theme parks. Las Vegas and Times Square are premiere examples of use of the phenomenon. The everyday city and town of America is also discovering the versatility and utility of the sign, increasingly encouraging its placement and use.

For many years, state highway departments have recognized the value of EMCs, and are increasingly using them to inform and direct traffic in large metropolitan areas, thereby easing traffic congestion and promoting traffic safety. Large-scale urban studies are currently being done to expand message center use in this area, with other "intelligent" components, to create integrated transportation systems. In the federal highway system, they are extensively utilized for regulatory, warning, and guidance purposes. And, the EMC is a critical component of the Amber Emergency Alert System.

The Federal Highway Administration's (FHWA) position on electronic signs was set out in a department memorandum, as follows:

> On November 6, 1978, the Surface Transportation Assistance Act of 1978, Public Law 95-599, amended the highway beautification law to allow on-premise signs that may be changed at reasonable intervals by electronic process or by remote control. Electronic signs were added by amending sections 131(c) and (j) as follows:
>
> (c)(3) signs, displays and devices including those which may be changed at reasonable intervals by electronic process or remote control, advertising activities conducted on the property on which they are located …
>
> (j) Any State highway department which has, under this section as in effect on June 30, 1965, entered into an agreement with the Secretary to control the erection and maintenance of outdoor advertising signs, displays, and devices in areas adjacent to the Interstate System shall be entitled to receive the bonus payments unless the State maintains the control required under such agreement: Provided, that permission by a State to erect and maintain information displays which may be changed at **reasonable intervals** by electronic process or remote control and which provide public service information **or advertise activities conducted on the property on**

State highway departments have safely used EMCs to inform and direct traffic for years due to their superior visibility.

which they are located [on-premise signs] shall not be considered a breach of such agreement or the control required thereunder.

Congress amended the "Highway Beautification Act" (HBA) to state:

> Subsection (d) of Section 131 of Title 23, United States Code, is amended by adding at the end thereof the following new sentence:
>
> "Nothing in this section shall authorize the Secretary to prohibit the use of any sign, display, or device which may be changed by electronic process or by remote control in any commercial or industrial area (whether zoned or unzoned) subject to this subsection.

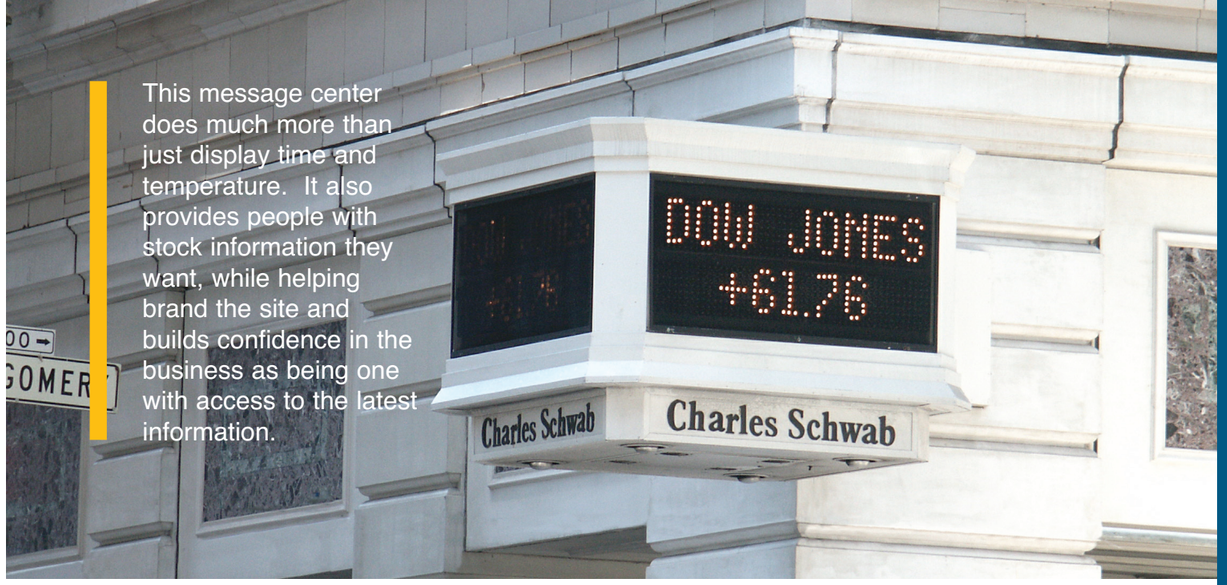
Following the HBA amendment, the FHWA remained skeptical about the safety of the EMC, and in 1980 commissioned researchers, Ross Netherton and Jerry Wachtel, to conduct a study of the device. The research assignment was to provide proof, based on highway crash data, that EMCs either directly caused or contributed to traffic accidents within their vicinity. After intensive investigation, the researchers found that no credible statistical evidence existed to support the conclusion that electronic or variable message centers negatively impacted road safety.[28]

Many Las Vegas businesses make dramatic use of EMCs.

In 2001, 21-years after the Netherton-Wachtel study, the FHWA conducted a second review of existing research addressing potential traffic safety issues associated with EMCs. The focus of the review was "electronic billboards," particularly tri-vision signs (changeable message signs with three-faced rotating panels which display three separate billboard messages in a sequential manner where one image advances as another retreats). The purpose of the review was to address "knowledge gaps" concerning the effects of electronic billboards on drivers' attention.

The report, entitled *Potential Safety Effects of Electronic Billboards on Driver Attention and Distraction*, was released on September 11, 2001. In section 2.3, Reports on Billboards and Safety, the report states, "Determining the effect of roadway commercial advertising billboards is a difficult endeavor for several theoretical and methodological reasons… Regardless of the difficulties, researchers have examined the effects of billboards on safety. The results are mixed and inconclusive" [as shown in the balance of the report]. Thus, two intensive FHWA traffic studies, produced 21 years apart, could make no conclusive finding correlating variable electronic message signs and roadway safety.

On November 6, 1978, the Surface Transportation Assistance Act of 1978, Public Law 95-599, amended the highway beautification law to allow on-premise signs that may be changed at reasonable intervals by electronic process or by remote control.



This message center does much more than just display time and temperature. It also provides people with stock information they want, while helping brand the site and builds confidence in the business as being one with access to the latest information.

Additional support for the position that outdoor advertising EMCs do not cause car crashes is found in the April 2, 2002 issue of the Federal Register, which references an Oregon Department of Transportation inquiry of the FHWA concerning tri-vision billboards. In the referenced materials, it is stated, "Tri-vision signs do not appear to compromise the safety of the motoring public," and "[a] majority of States allow tri-vision signs [with] no reports of increases in traffic accidents in those States due to tri-vision signs being installed adjacent to highways."

Most important for the on-premise sign user, the 2001 FHWA report essentially **excludes** safety inquiry into what the report calls "the simpler version of an electronic billboard – the electronic variable message sign – such as used by governmental agencies for presenting information to drivers [either] mounted above the roadway [if permanent] or located on the shoulder of the roadway [if mobile]." When the on-premise EMC is discussed in the report, both the "public" and the "private" device are referenced in terms of legibility/conspicuity studies that may have some applicability in future studies of the electronic billboard. For example, one such study referenced in the report found that the typical light emitting elements of the EMC provide high contrast between characters and background, and thus provide superior legibility performance over reflective signs at night, although careful adjustment was required to avoid nighttime contrast levels that might create halation or irradiation, blurring letters with wide stroke widths.

The comparison between EMCs used as traffic informational/directional devices safely and effectively used by government agencies and those used as informational/directional devices on individual premises in commercial districts is obvious. And, it is a testament to the safety of **on-premise** commercial EMCs that from 1980 to the present the FHWA has not seen any need to revisit the safety issue concerning these signs, or to withdraw its recognition of the legality of such signs under federal highway law, provided that:

(1) the displays are changed at reasonable intervals,
(2) the signage does not violate

28. Wachtel, Jerry and Netherton, Ross. *Safety and Environmental Design Considerations in the Use of Commercial Electronic Variable-Message Signage*, Report No. FHWA/RD-80/051, Federal Highway Administration, Washington, DC, June 1980. (Note: The researchers also made a general determination that roadside signs provided a stimulus that helped maintain driver alertness, and increased safety by combating "highway hypnosis.")

the compliance agreement's definition of flashing lights, and

(3) a state has accepted local controls in lieu of state controls, and such signs are considered to have been in customary use within the locality, **or** a **state court** has determined that such signs do not constitute flashing, intermittent or moving lights.

Since the FHWA has left determination of the frequency of message changes on private signs to the states and their jurisdictions, the question becomes, "What is a reasonable interval between message changes?" One source for the answer is the ubiquitous electronic "time and temperature" signs that change every 1-2 seconds, and do so without any negative impact on traffic safety. The *Manual on Uniform Traffic Control Devices* (MUTCD), Section 2E-21 provides additional guidance in determining the interval length for the safe display of a message:

> *The entire message cycle should be readable at least twice by drivers traveling at the posted speed, the off-peak 85th-percentile speed, or the operating speed.*

Clearly, for messages displayed along major highways, in order for a message to be readable at least twice before the targeted viewer passes it, the interval between displays will not be more than 1-2 seconds. It follows, therefore, that changes in message and/or light intensities that occur at 1-2 second intervals do not fall within the FHWA's definition of "flashing," "intermittent," or "moving;" otherwise the FHWA would be violating its own rules, regulations and compliance agreements in its use of the EMC on the federal highway system.

After intensive investigation, researchers have found that no credible statistic evidence exists to support the conclusion that EMCs negatively impact road safety.

State governments addressing the issue have generally set intervals at an average of 4 seconds (e.g., California) or 5 seconds (e.g., Louisiana). Some states are more liberal; for example, Iowa, in addressing tri-vision signs, has set an interval of 4 seconds, two of which may be taken up by the transition between panels. Idaho simply sets an exposure time that is "long enough at maximum speed limit for the sign's message to be readable and comprehensible."

Tri-vision billboards have been found to be safe and have never been linked to an increase in traffic accidents.

Local municipalities and counties have generally established that a reasonable interval for changes in electronic messages is anywhere from 1-5 seconds. An interval of more than five seconds would almost always defeat the purpose of the sign, which is to present 1-2 complete, legible and readable messages in time to be detected and understood, in full, by all approaching motorists of 20/40 visual acuity, traveling at the posted speed limit.

Summing Up

The evidence supports that appropriately sized, placed, illuminated, and maintained signs do not cause accidents. Such research should be recognized, as well as the assertion that inadequate signage may cause traffic accidents. One may then ask, "How does this relate to on-premise business signs?" Simply, Americans are a very

mobile people who routinely travel and purchase goods, products or services outside their local trade area. Drivers process messages received from signage, and depending upon needs or expectations of the moment, the messages become the basis for driver decisions.

Mobility requires traffic-oriented messages that are easily discernable and quickly readable and understandable. Hence, to safely assist mobility and meet the need for information, both commercial and non-commercial roadside signs should provide drivers with clear messages, which are visible under most environmental conditions.[29] Signs that do not optimally communicate because, for example, they are too small or are poorly placed, can create driver frustration or disorientation. Frustration often leads to unsafe driver responses, such as a left turn from a far right lane or an illegal U-turn.

The entire message cycle of an electronic message center should be readable at least twice by drivers traveling at the posted speed limit. Along major highways, this works out to 1-2 second intervals, which is not considered by the FHWA to constitute "flashing," "intermittent," or "moving."

To safely assist mobility and meet the need for information, both commercial and non-commercial roadside signs should provide drivers with clear messages, which are visible under most environmental conditions.

Disorientation is likely to cause a driver to vary speed, brake excessively, encroach on adjacent lanes, miss exits, or drive the wrong way on a one-way street. These driver behaviors are a common cause of accidents – accidents that could have been avoided had the pertinent sign been visible and readable in sufficient time for the viewer/driver to process its message and safely respond.

29. *See, Symposium on Effective Highway Accident Countermeasures*, Publication No. FHWA-SA-90-015 HHS-11/8-90 (1M600)E, U.S. Department of Transportation, Federal Highway Administration.