

EXECUTIVE SUMMARY

In July 2007, the Highways Subcommittee on Traffic Operations (SCOTE) of the Association of State Highway and Transportation Officials (AASHTO) issued a proposed policy resolution on outdoor advertising. This document recognized that inattentive driving was a major contributor to highway crashes, and that new technologies were enabling the outdoor advertising industry to display more attention-getting messages that were likely to cause drivers to be less attentive to the driving task. The document further noted that national interest and concern about the safety implications of these advanced outdoor advertising displays had been expressed by FHWA and TRB as well as by State and local government agencies. Because the subcommittee recognized the potential safety implications of such signs and the lack of “substantiating evidence” for determining appropriate guidelines for their control, SCOTE resolved to support the undertaking of research as quickly as possible into the safety and operational effects of these technologies and to forward its resolution to the AASHTO Standing Committee on Highways to be considered a high priority project for consideration by the Standing Committee on Research of the National Cooperative Highway Research Program (NCHRP). The SCOTE resolution became a Research Problem Statement [(NCHRP 20-7 (256)], which led to the undertaking of this work in February 2008.

The specific objective of the study was to develop guidance for State Departments of Transportation and other highway operating agencies with respect to the safety implications of digital display technology being increasingly used for outdoor advertising signs. The objective was to be achieved through the conduct of a critical literature review of existing guidelines and research results, including, separately, research undertaken and published by the outdoor advertising industry; an identification of the human factors elements related to the operational characteristics of such signs; a review of the experiences of other countries with this outdoor advertising sign technology; and the preparation of a final, peer reviewed, report documenting the work conducted and including recommended guidance related to the safety aspects of digital display technology for outdoor advertising signs.

Earlier reports published by FHWA in 1980 and 2001 had extensively reviewed the research literature in the field of outdoor advertising, and an FHWA study that ran concurrently with this project also included a review of the more recent research literature. The goals of the FHWA study, however, were quite different than those of the project reported here. Whereas this study had as its objective the development of guidelines that State and local government agencies could adopt immediately, the FHWA study sought to identify unmet research needs with regard to the potential impact of these signs on driver attention and distraction, and to propose a research strategy to fill these knowledge gaps. Thus, the two studies, conducted concurrently, were complementary - this one seeking to develop readily useable guidelines that could be implemented at the State and local level based on our existing knowledge base, and the other seeking a more comprehensive understanding of the safety implications of these signs that might lead to guidance and/or regulation at the Federal level.

Because the technologies used in the signs of interest in this report are relatively recent, and because these technologies have advanced quickly in key performance characteristics (e.g. brightness, resolution, off-axis viewing) and have become much more affordable in recent years, research, too, has increased dramatically since the 2001 FHWA report. Indeed, of the 150 references cited in this report, more than 20 represent original, empirical research, conducted roughly within the past decade, that directly or indirectly address the potential for driver distraction from outdoor advertising signs. Ironically, and consistent with the research studies cited in the prior FHWA reports, the technology continues to lead both policy and research, and only a small number of these studies actually dealt with these advanced digital display technologies. Such research was, however, sponsored by government agencies as well as industry, in the laboratory and in the field, using controlled experimental techniques as well as statistical analysis of crash summaries. In addition to research conducted in the US, the report reviews studies performed in England, Scotland, Finland, Australia, Canada, South Africa, Brazil and The Netherlands. Because of the complexity of the issue, the number of variables present in every real-world situation, and the difficulties of statistical and methodological control in the conduct of such research, we have attempted to make our review of the literature critical as well as comprehensive.

Several conclusions can be drawn from the extensive literature on this topic. First, there are strong theoretical underpinnings in the psychology of cognition, perception, psychophysics, and human factors, to suggest why stimuli such as roadside digital billboards can capture and hold a person's attention, even at the expense of primary task performance. Second, it is difficult to perform a study in this domain that does not suffer, at some level, from weaknesses that may affect the strength or generalizability of its findings. Third, the research sponsored by the outdoor advertising industry generally concludes that there are no adverse impacts from roadside digital billboards, even when, in one case, the actual findings of such research indicate otherwise. Conversely, the conclusions reached in research sponsored by government agencies, insurance companies, and auto safety organizations, especially in those studies performed in the past decade, regularly demonstrate that the presence of roadside advertising signs such as digital billboards, contributes to driver distraction at levels that adversely affect safe driving performance. Fourth, the recommendations from research, and the existence of guidelines or regulations that stem from that research, are quite consistent, although not fully so, both in the areas in which digital billboards are suggested for control (e.g. brightness, message duration and message change interval, and billboard location with regard to official traffic control devices, roadway geometry, and vehicle maneuver requirements at interchanges, lane drops, merges and diverges), and with regard to the specific constraints that should be placed on such signs' placement and operation. Several countries have developed comprehensive, thoughtful policies for control of roadside advertising, and their efforts can serve as models for State and local governments within the US. A number of US counties and cities, too, have developed policies and regulations for the control of digital outdoor advertising that comport with the research. In some cases, such local regulations are forward looking, in that they address technologies, or applications of technology, that are not yet in widespread use.

During the course of this project, we identified several recent extensions of digital advertising technologies that may add further to the distraction potential of these displays. The growing use of LED technology for advertising in on-premise applications is of concern because such signs may be larger than traditional billboards, closer to the right-of-way and to roadway sections with high task demands, and may include animation and full motion video. At least one State is considering the use of its official changeable message sign network for the display of digital advertising. And an unknown number of private or toll-road operators are also contemplating the sale of advertising within their rights-of-way. In addition, we are seeing the deployment of LED displays, often featuring video, on vehicles moving in the traffic stream. Vehicles as diverse as small trucks and vans, public transit buses, and large, over-the-road trailers, are now being outfitted with LED advertising, and the potential for driver distraction grows with each such installation. Our review suggests that, with few exceptions, government agencies have no regulations or guidelines in place to address these new uses. The newest digital billboards are also increasingly capable of “interacting” with approaching drivers. In some cases, the Radio Frequency Identification Device (RFID) embedded in a vehicle’s key or on-board computer system, can trigger a personalized message on a digital billboard; in other cases, the billboard can display a message tailored to the radio frequency of passing vehicles. Still other billboards encourage drivers to interact with the sign by texting a message or calling a number displayed on the billboard. A patent that incorporates cameras mounted to billboards, together with eye-movement recording devices, claims to be able to capture images of drivers, and their eye movements, as they approach the billboard. Our review has not identified any government agencies, in the US or abroad, that have addressed these new technologies or their applications.

The report consists of ten parts. After an introduction and background presentation in Section 1, the literature in the field is comprehensively and critically reviewed. General research is discussed in Section 2, and research sponsored by the outdoor advertising industry is presented in Section 3. The key human factors issues that inform the potential response of drivers to digital roadside billboards are summarized in Section 4. Section 5 of the report reviews a representative sample of guidelines and regulations that currently exist in a number of foreign countries as well as in several jurisdictions within the US. This is followed by a series of recommendations for potential regulations and guidance in Section 6. These recommendations are those that (a) have worked elsewhere, and (b) are based on sound research or science, and therefore might have practical applications for those jurisdictions seeking guidance to inform their own decision-making. Section 7 addresses issues of digital advertising on-premise and on right-of-way. Section 8 discusses some of the newest roadway-related applications of computer-controlled LED advertising that have begun to appear on and adjacent to public roads in the US and abroad, and for which little policy has yet been considered. Section 9 summarizes the report’s conclusions, and Section 10 presents the list of references cited in the body of the report.