

1. Report No. UMTRI-2006-31		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Recent Changes in Headlamp Illumination Directed Toward Traffic Signs				5. Report Date September 2006	
				6. Performing Organization Code 302753	
7. Author(s) Sivak, M., Schoettle, B., and Flannagan, M.J.				8. Performing Organization Report No. UMTRI-2006-31	
9. Performing Organization Name and Address The University of Michigan Transportation Research Institute 2901 Baxter Road Ann Arbor, Michigan 48109-2150 U.S.A.				10. Work Unit no. (TRAIS)	
				11. Contract or Grant No.	
12. Sponsoring Agency Name and Address The University of Michigan Industry Affiliation Program for Human Factors in Transportation Safety				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes The Affiliation Program currently includes Alps Automotive/Alpine Electronics, Autoliv, Avery Dennison, Bendix, BMW, Bosch, Com-Corp Industries, DaimlerChrysler, DBM Reflex, Decoma Autosystems, Denso, Federal-Mogul, Ford, GE, General Motors, Gentex, Grote Industries, Guide Corporation, Hella, Honda, Ichikoh Industries, Koito Manufacturing, Lang-Mekra North America, Magna Donnelly, Muth, Nissan, North American Lighting, Northrop Grumman, OSRAM Sylvania, Philips Lighting, Renault, Schefenacker International, SiseCam, SL Corporation, Stanley Electric, Toyota Technical Center USA, Truck-Lite, Valeo, Visteon/ACH, 3M Personal Safety Products and 3M Traffic Safety Systems. Information about the Affiliation Program is available at: <a href="http://www.umich.edu/~industry">http://www.umich.edu/~industry</a>					
16. Abstract This study examined the differences in sign light between 1997 tungsten-halogen and 2004 HID low-beam headlamps manufactured for use on U.S. vehicles. The results indicate that the HID's tended to deliver less light above the horizontal straight ahead and to the left of the vertical, and less light to the right of the vertical above about 1.5° up. The consequences of the changed beam pattern were analyzed in detail for three typical sign locations: center overhead, right shoulder, and left shoulder. The most frequent geometric conditions were modeled: a straight road, and very large-radius left and right curves, all with no vertical curvature. Viewing distances between 50 m and 300 m were considered. The results imply that with current HID low beams, sign retroreflective efficiency would need to be increased to maintain the effectiveness that a given sign had a decade ago with tungsten-halogen low beams. This applies to overhead signs on straight roads and on very large-radius left and right curves, and to right and left shoulder-mounted signs on straight roads and on very large-radius left curves.					
17. Key Words headlamps, low beams, traffic signs, illumination, trends				18. Distribution Statement Unlimited	
19. Security Classification (of this report) None		20. Security Classification (of this page) None		21. No. of Pages 15	22. Price