U.S. Department of Transportation
Federal Highway Administration

Memorandum

SENT VIA ELECTRONIC MAIL

Subject: INFORMATION: Guidelines for Public Interest Findings and Certifications for Retroreflective Sign Sheeting

Date: July 20, 2006

From: Jeffrey A. Lindley
Associate Administrator for Safety

Reply to
Attn. of: HSA-10

To: Division Administrators

The enclosed document titled "Guidelines for Evaluating Public Interest Findings and Certifications for Retroreflectivity Sheeting for Traffic Control Devices" provides additional information for Divisions to assist in decision-making in this specialized technical area. This document was requested by the Division Safety Specialists at the March 2006 Safety Leadership Conference. It builds upon our January 13 memorandum, "Sign Sheeting Proprietary Products," by providing further details and information on the status of sign sheeting standards and processes for approving public interest findings and product certifications. It also includes a brief summary of the process for approving experimental requests.

The Divisions also requested a ready-reference "Retro 101" document that explains the fundamentals of retroreflectivity. That document is under development and will be available before the end of September.

Questions or additional information about this guidance may be directed to any of the retroreflectivity team members noted in the guidance document. We hope this guidance serves as a useful resource to help make decisions regarding sign sheeting alternatives in your State.

Attachment

cc: Director of Field Services
Associate Administrators
Resource Center Safety and Design TST
Resource Center Operations TST

Guidelines for Evaluating Public Interest Findings and Certifications for Retroreflective Sheeting for Traffic Control Signs

PURPOSE

This document provides guidance to the FHWA Division Offices on evaluating State Transportation Agency (STA) and local agency requests to use proprietary retroreflective sheeting on traffic control signs under 23 CFR 635.411. Specific issues that are covered include requests for public interest findings (PIFs) for the use of specific retroreflective sheeting materials, and certifications that a specific retroreflective sheeting is "a unique product for which there is no suitable alternate." In addition, the procedures for requesting and approving an experimental evaluation of proprietary retroreflective sheeting materials are briefly discussed.

INTRODUCTION

Traffic control devices provide one of the primary means of communicating vital information to users of the street and highway transportation network in the United States. Traffic signs are a major component of the traffic control device system, and provide drivers with information about traffic laws and regulations, potential hazards in or near the roadway, and navigational directions and information about destinations. The Manual on Uniform Traffic Control Devices (MUTCD) specifies that all traffic signs on public roads shall be retroreflectorized to provide a level of visibility and legibility to the nighttime motorist, but does not specify the level of retroreflectivity required for any given sign. The FHWA is currently in the process of developing minimum levels of in-service retroreflectivity, to establish minimum maintained performance levels of signs in the field. However, these maintained performance levels will not provide complete guidance to help transportation agencies choose among the wide variety of retroreflective sign materials currently available.

While ASTM D4956, *Standard Specification for Retroreflective Sheeting for Traffic Control*, provides a description of the retroreflective sheeting materials available for signing, it does not provide guidance for selecting materials for a specific sign or group of signs. A recently completed NCHRP research project was directed toward the development of a "tool" to help practitioners identify the most appropriate type of retroreflective sheeting material for a given sign, or a group of signs (http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+4-29). While this effort made progress toward its goal, it was not able to fully develop the "tool" because of the vast array of issues involved with making wide sweeping conclusions.

Several recent trends in transportation have led to general recommendations for brighter or bigger traffic signs. These trends include an increasing percentage of older drivers, increased nighttime truck traffic, new headlamp beam profiles with reduced "uplight," elimination of overhead guide sign lighting, etc. Comparing the tradeoffs between brighter or bigger retroreflective signs usually results in signs with higher levels of retroreflectivity being more economical. A lack of specific guidance on the selection of appropriate retroreflective sheeting materials for signs has left transportation agencies to rely on in-house or external expertise in making those selections. The overall complexity of the situation has resulted in many agencies

determining that the best course of action is to set their sign sheeting specifications as high as possible, utilizing new technologies and materials to counter the trends listed above.

BACKGROUND

23 CFR 635.411, "Material or Product Selection," prohibits the expenditure of Federal-aid funds on Federal-aid projects "for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plan and specifications…" (referred to hereafter as "proprietary product"), unless specific conditions are met. This regulation is intended to ensure competition in the selection of materials, products, and processes while also allowing the opportunity for innovation where there is a reasonable potential for improved performance. With regard to retroreflective sheeting used for traffic control signs, new materials that show sufficient promise may be approved for inclusion on Federal-aid projects, but limiting competition to a specific product requires that such a limitation be evaluated and determined to be appropriate pursuant to 23 CFR 635.411.

A proprietary requirement is established when a product is so narrowly specified that only a single provider can meet the specification, or when a specific brand name is used, e.g.; 3M DG3, or Avery Dennison OmniView. In most cases, STAs and local agencies use the Type designations defined in ASTM D4956 to specify sheeting materials (a recent survey indicated that all but one STA uses ASTM D4956 Type designations in State specifications).[1] Although the use of an industry consensus standard, such as ASTM D4956, would appear to meet requirements for competitive bidding, ASTM D4956 so narrowly specifies sheeting that, in some cases, only a single product can meet a given Type designation. For instance, specifying ASTM Type VII material results in a proprietary requirement because only one product meets the ASTM D4956 Type VII requirements (3M DG LDP). Until the fall of 2005, specifying ASTM Type IX material also led to a proprietary requirement (only 3M DG VIP). A new sheeting material was then introduced that met ASTM Type IX retroreflectivity criteria—Avery Dennison OmniView T-9500). Although a new ASTM Type XI designation is only proposed at this time, if a STA or local agency specifies this material it will result in a proprietary requirement (only 3M DG3 will meet the proposed Type XI designation being balloted by ASTM D04 as of June 2006). Thus, the use of an ASTM D4956 Type designation does not ensure that a contract requirement will be competitive.

The use of a STA Qualified or Approved Products List (QPL/APL) also does not automatically result in a competitive process. Many STAs require that new products be subjected to three years of testing under the National Transportation Product Evaluation Program (NTPEP) to demonstrate that the sheeting meets ASTM D4956 requirements for retained retroreflectivity and color prior to being added to a QPL. This is a reasonable and prudent action, intended to ensure that there is no inherent flaw in a material that might result in premature failure of traffic control signs. Thus, the new ASTM Type IX sheeting mentioned above would not be eligible for listing on many STA QPLs until the required three years of testing is complete, and therefore purchase of ASTM Type IX sheeting by reference to the QPL may remain a proprietary requirement.

[1] A sheeting identification chart is available at: www.fhwa.dot.gov/retro. Click on "Sign Retroreflectivity" then "Resource Materials" and then "Sheeting Guide."

There is a variety of information available that addresses proprietary product issues. A list of available references is included below. Unless otherwise noted, these references were used to develop the guidance contained in this document.

- Guidance on Patented and Proprietary Product Approvals – FHWA Memo, January 11, 2006. www.fhwa.dot.gov/programadmin/contracts/011106.cfm
- Sign Sheeting Proprietary Products – FHWA Memo, January 13, 2006.
- Questions and Answers Regarding Title 23 CFR 635.411, www.fhwa.dot.gov/programadmin/contracts/011106qa.cfm
- Construction Projects – Incorporating Experimental Features, www.fhwa.dot.gov/programadmin/contracts/expermnt.cfm
- 23 CFR 635.411 – Material or Product Selection, http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl, Title 23: Highways.
- Contract Administration, Core Curriculum, Participant's Manual and Reference Guide, 2005, Chapter IIC-3. Public Interest / Cost Effectiveness Findings. www.fhwa.dot.gov/programadmin/contracts/cc_IIC.htm#IIC5b

GUIDELINES FOR EVALUATING CERTIFICATIONS & PUBLIC INTEREST FINDINGS

The conditions described in 23 CFR 635.411 and through the January 11, 2006 Q&As that must be satisfied to allow the use of proprietary products include[2]:

1. Competitive bidding:
    a. The proprietary product is obtained through competitive bidding with other suitable proprietary and nonproprietary products from multiple manufacturers.
    b. A competitively bid performance-based warranty specification is permitted, if it does not limit product selection to a single source.
2. A certification by the contracting agency that the specified proprietary product is either:
    a. Necessary for synchronization with existing facilities; or
    b. A unique product for which there is no suitable alternate.
3. A proprietary item is to be used for research or for a distinctive type of construction on relatively short sections of road on an experimental basis.
4. Whenever the Division Administrator approves of the STA's request to use a proprietary product as being in the public interest. For this provision, a specific material is being specified when there are other acceptable materials and products available. When the Division Administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures are used that establish the unit price of each acceptable alternative. In this case Federal-aid participation will be based on the lowest price so established.

If a STA or local agency desires to use proprietary retroreflective sheeting material for a given type or all traffic signs within a jurisdiction and intends to use Federal-aid funds for purchase of the signs, the agency must follow one of the four basic options listed above. The following is

[2] This list is only a partial summary of 23 CFR 635.411. The full text is found in Appendix A.

guidance when a public interest finding is requested, or when the state certifies there is no suitable alternate.

Request for Public Interest Finding

When more than one acceptable material or product is available for use and an agency seeks to limit purchase to a specified material, a PIF must be submitted for review and approval by the Division Administrator. While there is no specific format for a PIF, the level of documentation should be dependent upon the specific nature of the product and projects involved. In general, the request for a PIF should document the reasonableness of the agency's minimum needs and the best method to meet these needs consistent with the requirement for the broadest practical competition. The supporting material may include engineering and economic considerations, product availability and compatibility, logistical concerns, and other unique considerations. The actual public interest finding will consist of a written document outlining the basis for the request and any supporting documentation, such as a cost/benefit analysis; discussion of product compatibility; logistical concerns; etc.

A PIF will ideally have the following paragraph headers, using additional headers as needed.

- Description of need, including limitations and conditions (i.e., what types of signs, what types of roadways, etc.);
- Engineering / economic analysis supporting the requested action, and
- Duration of approval

The description of need should clearly outline the desired action that is the subject of the PIF. As an example, a STA may request that a proprietary product be specified for retroreflective sheeting to be used for guide sign legends on overhead guide signs placed on roads included on all Interstates. This section should also include a brief synopsis of the justification for the request, such as the savings that will accrue due to reductions in inventory or simplification in manufacturing processes, or reduced life-cycle costs.

The analysis provided in the request should be based on factual, verifiable data, with assumptions clearly identified. A PIF should be based on tangible, quantifiable benefits, such as reduced life-cycle costs or reductions in inventory. For example, increased durability can offset higher initial costs to the point that the higher cost of a certain sheeting material may be justified if its life-cycle costs yield the lowest overall cost. The request for a PIF should also clearly identify other contractual or performance implications that would result from approval of the request. For instance, if a specific product is approved for guide sign legends, then it should be clear whether the manufacturer seeks to impose restrictions on the selection of the background sheeting through the manufacturer warranty.

The PIF should also include a request for a specific date of approval as well as the length of time that the PIF is in effect. PIFs should be reviewed on a periodic basis to assess changes in the market conditions and re-examine the need for the PIF. A period of two to five years is recommended for retroreflective sheeting for use on traffic signs.

If a STA or local agency makes a request based on unique performance characteristics (a unique product for which there is no suitable alternate), the agency should be instructed to certify their requirement, and proceed in accordance with the provisions of 23 CFR 635.411(a), as described below.

A STA or local agency may include past performance as an evaluation criterion in competitive bids, or may establish warranty provisions within the requirements for retroreflective sheeting to protect against material failures. The durability of a product, resulting in a proven longer service life, may be the basis of an economic analysis that supports the request for a NPF based on lower service-life costs.

STA Certifications

23 CFR 635.411(a) permits the use of proprietary materials when "no equally suitable alternate exists." It is the responsibility of the appropriate STA or local agency to make that determination and provide a certification. The Division Administrator should carefully review the analysis that provided the basis for the certification and determine if the certification is supported by clearly articulated facts and credible, well described research findings and/or operational experience.

When the STA certifies that a proprietary product is required because no equally suitable alternate exists, the certification should contain the following elements:

- A description of how the proprietary product requirement will benefit the public.
    - What unique needs are being addressed that result in no equally suitable alternate, e.g., high percentage of older population?
    - Are there identified safety locations or critical decision points that would justify a higher standard of retroreflectivity?
- An evaluation of the pool of potential products, and a description of why these products cannot meet the STA's or local agency's needs.
- An estimate of additional costs incurred as a result of this proprietary product requirement.

In the case of retroreflective signs, direct safety benefits measured in terms of crashes are often not quantifiable. Thus, alternative metrics, such as increased legibility distance and improved driver acquisition times, may be used to support a determination that no suitable alternate exists for a specific sheeting. Naturally, the use of alternative metrics leads to the question of how much increase in legibility distance is needed or how much decrease in driver acquisition time is needed to justify purchase of a proprietary product. While there is no magic number, one example of a similar situation is the FHWA Interim Approval for Clearview font on positive contrast guide signs[3]. Research showed that signs made with the Clearview font had 16 percent longer recognition distances among older drivers and 12 percent longer legibility distances (compared to signs of the same size made with the standard FHWA font). Research results providing similar findings in support of a specific retroreflective sheeting should be weighted heavily.

[3] http://mutcd.fhwa.dot.gov/res-ia_clearview_font.htm

A common basis for submittal of STA or local agency certifications is the belief that "brighter is better." The human visual system largely functions on a logarithmic scale, yet has high sensitivity to differences at any given luminance level. This means that an individual may notice a difference between two signs placed side-by-side, but is not able to discern a difference if the signs are shown one-after-another along a driving route. The benefit of higher brightness also plateaus relatively quickly, such that an increase in brightness (or luminance in terms of photometry) that is readily apparent on a linear scale may not provide measurable or practical differences on the road. In addition, brighter values do not necessarily translate into longer lasting materials. Thus, the value of higher brightness for the need identified should be assessed and documented as part of the certification.

One of many approaches to evaluating whether or not a proprietary product may provide a significant improvement over other retroreflective sheeting materials is for the STA or local agency to provide an engineering estimate of the increase in the percent of nighttime drivers served by the proprietary product.[4] Figures 1 and 2 illustrate "supply and demand" curves for various retroreflective sheeting materials used on overhead guide signs. The supply curves represent the luminance provided by different materials when illuminated by a specific headlamp in a specific vehicle at a specific viewing geometry. These curves were generated using a computer modeling program known as ERGO.[5] The demand curves, for a given percentage of drivers served, are based on FHWA sponsored research efforts to develop minimum maintained retroreflectivity levels.[6,7] The pool of subjects used in the FHWA sponsored research were all licensed drivers in the State of Texas and were 55 years of age or older (average age was 62). The percentages of drivers served for the two vehicle types evaluated, based on the visual performance of the subject group, are outlined in Table 1.

[4] The "percent nighttime driver served" is one of many metrics that may be used to assess retroreflective sheeting performance. It can be estimated using different approaches as well. An alternative approach is outlined in the following reference: Johnson and Sauter, Percent Drivers Served for Headlamp Illuminated Retroreflective Overhead Signs, Proceedings from the 6th International Symposium on Automotive Lighting, Darmstadt University of Technology, Germany, 2005, pp. 901-911.

[5] Exact Road Geometry Output, available for free at http://www.reflectives.averydennison.com/

[6] Carlson, P.J. and H.G. Hawkins. Updated Minimum Retroreflectivity Levels for Traffic Signs. FHWA-RD-03-081. U.S. Department of Transportation, Federal Highway Administration, Washington, DC, 2003.

[7] Carlson, P.J., H.G. Hawkins, G.F. Schertz, D.J. Mace, and K.S. Opiela. Developing Updated Minimum In-Service Retroreflectivity Levels for Traffic Signs. In Transportation Research Record 1824, TRB, National Research Council, Washington, DC, 2003, pp. 133-143.

Table 1. Percent Drivers Served at legibility threshold for Overhead Guide Sign Example.
(16 inch letters --- 640 feet with and without visual complexity)

ASTM D4956 Type Designation		Type XI*	Type IX	Type VIII	Type VII	Type IX	Type III	Type II	Type I
Retroreflective Sheeting Material Brand Name		3M DG3	AD 9500	AD 7500	3M DG LDP	3M DG VIP	Beaded High-Intensity	Super Engineer Grade	Engineer Grade
Vehicle Type	Visual Complexity								
SUV	None	91	87	90	92	86	76	<50	<50
	Present	90	86	89	90	86	56	<50	<50
HV	None	88	84	85	86	85	<50	<50	<50
	Present	87	80	81	84	80	<50	<50	<50

*Establishment of ASTM Type XI is under ballot within ASTM as of June 2006.

If an agency knows their nighttime vehicle mix, they can use the data in Table 1 to generate an estimate of the percent nighttime drivers served for various sheeting materials used for overhead guide signs. For example, say the nighttime traffic along a highway without visual complexity is 40 percent heavy vehicles. Then 60*91% + 40*88% ≈ 90% of nighttime traffic would be accommodated with DG3, while for Omniview and VIP it would be approximately 86%. In a similar manner, increases in the percentage of nighttime drivers that are older can be accounted for by running the analyses with different assumptions, such as changing the assumed legibility index (e.g., lowering it from 40 to 35 or 33 feet per inch of letter height).

There are an infinite number of potential scenarios that could be calculated using this approach. Justification for the use of a proprietary sheeting material should include the appropriate analyses for the types of signs for which the request is being made. In other words, this example includes overhead guide signs with 16-inch letters mounted perpendicular to the roadway surface. STA's or local agencies with different standards will have to use different assumptions. In addition, this example is based on a criterion of satisfying legibility distance associated with a legibility index of 40 feet per inch of letter height, as per the MUTCD. This can be considered the threshold maximum nighttime legibility distance. If a different assumption is used, it should be justified.

EXPERIMENTAL REQUESTS

Products appear from time to time that are new and innovative. If the STA or local agency requests to use a proprietary retroreflective sheeting material for research it must submit an experimental product work plan for review and approval. The work plan should provide for the evaluation of the sheeting material, and where appropriate, a comparison with other non-proprietary sheeting materials. Additional information can be found at

http://www.fhwa.dot.gov/programadmin/contracts/expermnt.htm. It is recommended that the STA or local agency submit the product evaluation results information to the AASHTO Product Evaluation Listing (APEL) database so that other agencies may benefit from their experience. The APEL is available on the AASHTO Internet site at: http://apel.transportation.org/programs/apel/site.nsf/homepage/Overview?OpenDocument.

SUMMARY

These guidelines are intended to assist practitioners with making informed decisions regarding sign sheeting products. The FHWA retroreflectivity team is available to assist Divisions and States/local agencies as requested. The decision to accept a Public Interest Finding or Certification is made at the Division level.
For further information, contact the following retroreflectivity team members:

Greg Schertz, Retroreflectivity Team Leader, at 720-963-3704

Carl Andersen (202-493-3366) and Abdul Zineddin (202-493-3369), Turner Fairbank Contacts

Hari Kalla, Operations Retroreflectivity Contact at 202-366-5915

Dee Chappell, Office of Safety Retroreflectivity Program Manager at 202-366-0087

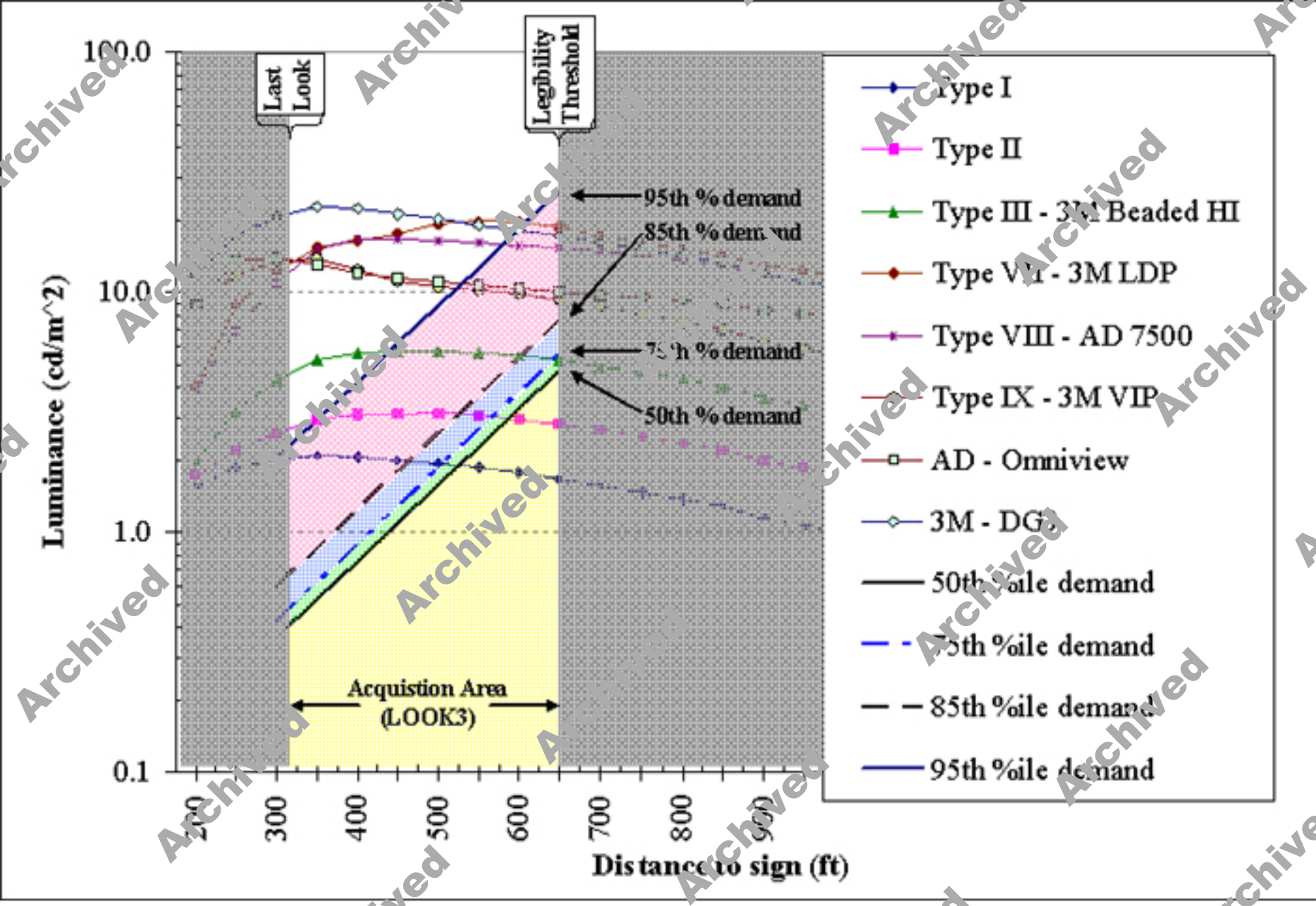

Figure 1. Computer evaluation of supply and demand curves for overhead guide sign mounted 25-feet high, centered in travel lane with no tilt, illuminated by UMTRI 2004 headlamp and viewed from NCHRP 4-29 SUV.

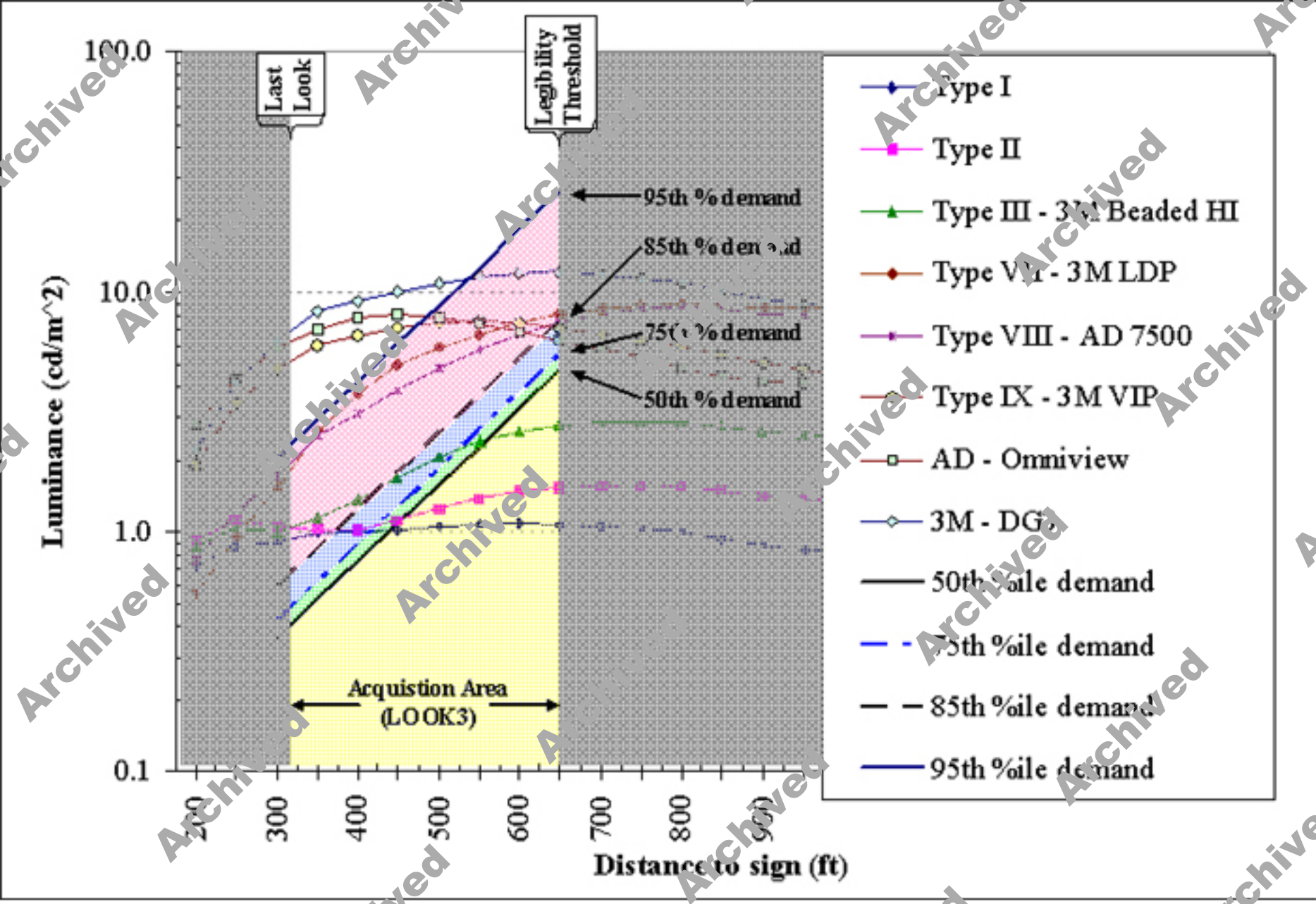

Figure 2. Computer evaluation of supply and demand curves for overhead guide sign mounted 25-feet high, centered on travel lane with no tilt, illuminated by UMTRI 2004 headlamp and viewed from NCHRP 4-29 heavy vehicle.

§ 635.411 Material or product selection.

(a) Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plans and specifications for a project, unless:
  (1) Such patented or proprietary item is purchased or obtained through competitive bidding with equally suitable unpatented items; or
  (2) The State transportation department certifies either that such patented or proprietary item is essential for synchronization with existing highway facilities, or that no equally suitable alternate exists; or
  (3) Such patented or proprietary item is used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes.

(b) When there is available for purchase more than one nonpatented, nonproprietary material, semi finished or finished article or product that will fulfill the requirements for an item of work of a project and these available materials or products are judged to be of satisfactory quality and equally acceptable on the basis of engineering analysis and the anticipated prices for the related item(s) of work are estimated to be approximately the same, the PS&E for the project shall either contain or include by reference the specifications for each such material or product that is considered acceptable for incorporation in the work. If the State transportation department wishes to substitute some other acceptable material or product for the material or product designated by the successful bidder or bid as the lowest alternate, and such substitution results in an increase in costs, there will not be Federal-aid participation in any increase in costs.

(c) A State transportation department may require a specific material or product when there are other acceptable materials and products, when such specific choice is approved by the Division Administrator as being in the public interest. When the Division Administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures are used that establish the unit price of each acceptable alternative. In this case Federal-aid participation will be based on the lowest price so established.

(d) Appendix A sets forth the FHWA requirements regarding (1) the specification of alternative types of culvert pipes, and (2) the number and types of such alternatives which must be set forth in the specifications for various types of drainage installations.

(e) Reference in specifications and on plans to single trade name materials will not be approved on Federal-aid contracts.

(f) In the case of a design-build project, the following requirements apply: Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the Request for Proposals document unless the conditions of paragraph (a) of this section are applicable.