

**VIRGINIA DEPARTMENT OF TRANSPORTATION**  
**TRAFFIC ENGINEERING DIVISION**  
**INSTRUCTIONAL & INFORMATIONAL MEMORANDUM**

<b>GENERAL SUBJECT:</b>  Signs Lighting	<b>NUMBER:</b> IIM-TE-380.1
	<b>SUPERSEDES:</b> IIM-TE-380
<b>SPECIFIC SUBJECT:</b>  Overhead Sign Lighting	<b>DATE:</b> May 10, 2019
	<b>SUNSET DATE:</b> None
<b>APPROVAL:</b>  <div style="text-align: center;"> <p>/original signed by/  Raymond J. Khoury, P.E.  State Traffic Engineer  Richmond, VA  May 3, 2019</p> </div>	

Changes are shaded

**SUMMARY OF CHANGES**

- Significant revisions to procedure for evaluating whether sign lighting is justified. Revisions align with:
  - The Department’s current and proposed sign sheeting policy revisions, and
  - NCHRP Report 828, [Guidelines for Nighttime Visibility of Overhead Guide Signs](#) (released in 2016, subsequent to the previous version of this IIM).
- **VDOT’s default position is “no sign lighting”; sign lighting shall not be provided except where justified as per this IIM;**
- Existing sign lighting shall be evaluated for potential decommissioning (cutting power to the lights) whenever an existing sign panel is replaced. Districts are also encouraged to examine potential sign lighting decommissioning for sign panels not slated for immediate replacement.
- Explain effect of “Visual Complexity Rating” on sign lighting decisions.
- End the practice of designing structures without sign lighting for future addition of sign lighting. (This change matches recent revisions to Standard Drawing OSS-1.)
- Add special considerations for overhead signs on arterials and collectors.
- LEDs shall be used for all sign lighting luminaires.
- Luminaire Retrieval Systems should not be used, except where determined necessary on case-by-case basis. (This change matches recent revisions to Standard Drawing OSS-1.)

## **PURPOSE AND NEED**

Multiple studies of overhead sign lighting have demonstrated that the sign lighting is not necessary for most overhead guide signs with highly retroreflective sheeting; most signs, except those in areas with very high background visual complexity or in areas prone to routine heavy fog, will be sufficiently legible without illumination.

Drawbacks to unwarranted overhead sign lighting include:

- Initial installation cost (structural costs, luminaires, control center cabinets, etc.),
- Ongoing maintenance costs (electric utility costs, periodic luminaire replacement, etc.),
- Exposure of motorists and workers to increased risk of work zone crash during relamping, and
- Light pollution.

Section 2E.06 of the 2009 Manual on Uniform Traffic Control Devices (MUTCD) states that “*Overhead sign installations should be illuminated unless an engineering study shows that retroreflectorization alone will perform effectively* [emphasis added]”. This Memorandum shall be used by designers when performing that engineering study.

## **EFFECTIVE DATE**

New overhead sign structures (Design-Bid-Build contracts): This Memorandum shall be effective for construction projects where the signing plans have not begun final design. This Memorandum should also be applied to contracts for which final signing plans are in progress or have already been completed wherever practical and feasible; the additional design costs to modify the signing plans will likely be offset by the initial plus long-term cost savings to the Department achieved by eliminating unnecessary sign lighting.

The previous version of this Memorandum was effective for all contracts advertised on or after October 15, 2015.

New overhead sign structures (Design-Build and P3 contracts): This Memorandum shall be effective for all Design-Build and P3 Contracts for which the RFQ Information Package has not been publicized as of the effective date of this memorandum. For contracts already in progress, this Memorandum should be utilized to the extent feasible.

Existing overhead sign structures with lighting: Existing sign lighting shall be evaluated for potential decommissioning (cutting of power to the existing lights) whenever an existing sign panel is replaced. VDOT Districts are also encouraged to use this Memorandum to examine potential decommissioning of sign lighting for sign panels not slated for replacement.

Existing overhead sign structures without lighting: Existing sign structures without sign lighting should not be retrofitted for sign lighting addition unless justified by an engineering study with concurrence from Central Office Traffic Engineering Division.

## **STANDARDS**

### **Section 1 – Engineering Study Criteria**

An engineering study<sup>1</sup> shall be used to evaluate whether overhead signs should be illuminated with sign lighting. **VDOT’s default position is no sign lighting; sign lighting shall not be provided unless determined to be justified** based on the procedures in this Memorandum.

Overhead Variable Message Signs (including signs that have both static and variable elements, but for which less than 50% of the surface area is static) do not require sign lighting.

These criteria apply to major overhead guide signs or enlarged regulatory/warning signs (e.g. W19-1 “Freeway Ends 1 Mile” signs) that are attached to cantilever, butterfly, span, or bridge-mount sign structures. They do not apply to signs mounted to mast arms, span wires, or traffic signal span structures.

Overhead sign lighting requirements are detailed in **Tables 1A-1B** below. “Unencumbered Sight Distance” (USD) and “Visual Complexity Rating” (VCR) are defined in Sections 2 and 3 of this Memorandum respectively.

Note that VDOT uses the same sheeting type for both background and legend (characters, arrows, border, and route marker shields) of signs.

All overhead guide signs in Afton Mountain and Fancy Gap Mountain fog areas shall have sign lighting, regardless of VCR, sheeting type, or unencumbered sight distance.

**Table 1A – Overhead Sign Lighting Requirements on Limited-Access Highways**

<b>VCR</b>	<b>Existing Signs With Type III Sheeting</b>	<b>Existing or New Signs with Type IX Sheeting</b>	<b>New Signs with Type XI sheeting<sup>2</sup></b>
<b>5</b>	Required	Required	Lighting required; use Type IX sheeting
<b>4</b>	Required	<ul style="list-style-type: none"> <li>• USD &lt; 800 ft: required</li> <li>• USD 800-950 ft: required for certain critical signs**</li> <li>• USD &gt; 950 ft: Do not illuminate</li> </ul>	<ul style="list-style-type: none"> <li>• USD &lt; 800': lighting required; use Type IX sheeting</li> <li>• USD ≥ 800': do not illuminate; use Type XI sheeting</li> </ul>
<b>3</b>	Required	<ul style="list-style-type: none"> <li>• USD &lt; 800 ft: required</li> <li>• USD 800-950 ft: required for certain critical signs**</li> <li>Sight distance &gt; 950 ft: Do not illuminate</li> </ul>	Do not illuminate; use Type XI sheeting

<sup>1</sup> The engineering study used to evaluate sign lighting does not require signing and sealing by a Professional Engineer.

<sup>2</sup> As of March 2019, VDOT is currently finalizing revisions to the Road & Bridge Specifications that will require Type XI sheeting for all overhead signs in contracts advertised after date of the Specifications revision.

<b>2-1</b>	<ul style="list-style-type: none"> <li>• Marginal condition***: Illuminate &amp; schedule for replacement.</li> <li>• Acceptable condition: Decommission; keep equipment in place to allow for future recommission if necessary.</li> </ul>	Do not illuminate	Do not illuminate; use Type XI sheeting
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**Table 1B - Overhead Sign Lighting Requirements on non-Limited Access Highways**

VCR	Existing Signs With Type III Sheeting	Existing or New Signs with Type IX Sheeting	New Signs with Type XI sheeting
<b>5</b>	Required	Required	Lighting required; use Type IX sheeting
<b>4</b>	Required	<ul style="list-style-type: none"> <li>• USD &lt; 500 ft: required</li> <li>• USD 500-650 ft: required for certain critical signs**</li> <li>• USD &gt; 650 ft: Do not illuminate</li> </ul>	<ul style="list-style-type: none"> <li>• USD &lt; 500': lighting required; use Type IX sheeting</li> <li>• USD ≥ 500': do not illuminate; use Type XI sheeting</li> </ul>
<b>3</b>	Required	<ul style="list-style-type: none"> <li>• USD &lt; 500 ft: required</li> <li>• USD 500-650 ft: required for certain critical signs**</li> <li>• USD &gt; 650 ft: Do not illuminate</li> </ul>	Do not illuminate; use Type XI sheeting
<b>2-1</b>	<ul style="list-style-type: none"> <li>• Marginal condition***: Illuminate &amp; schedule for replacement.</li> <li>• Acceptable condition: Decommission; keep equipment in place to allow for future recommission if necessary.</li> </ul>	Do not illuminate	Do not illuminate; use Type XI sheeting

\*\* Critical signs include:

- Signs that carry an unusually complex message (e.g. three or more destinations and multiple route shields on the same sign)
- Signs for a System Interchange (junction between two interstates/limited access highways)
- Signs for left-hand exits
- Existing signs with noticeably substandard text heights
- NOTE: signs do not automatically require lighting solely because they are deemed "critical". For example a critical sign with VCR of 2 or 1 shall not be illuminated.

\*\*\* Signs are considered to be in marginal condition if they have noticeably deficient retroreflectivity at night, and/or exhibit visible cracking, peeling, or fading.

If sign lighting is required for any one sign on a structure, then sign lighting should be supplied for all major signs in the same direction. However, signs for the opposite direction of traffic shall be evaluated separately.

If the sign shows signs of significant age (cracking, peeling, or faded text), then the sign should be assumed to have Type III sheeting.

The following guidelines may be used when attempting to ascertain sheeting type of existing signs:

- Most signs installed prior to June 2011 used Type III sheeting.
- Signs installed after June 2011 (when VDOT changed its sign sheeting specifications) are either Type III or Type IX, depending on the contract's date of advertisement.
- Signs installed prior to 2005 (when VDOT adopted first adopted a Clearview lettering policy) used Highway Gothic lettering for the mixed-case destination messages. Signs installed between 2005 and 2015 typically used Clearview lettering for the mixed-case destination messages, depending on the contract's advertisement date. Signs installed after 2015 may have used either Clearview or Highway Gothic lettering, depending on the status of the signing plans during the 2016-2017 period when FHWA had temporarily ended its Interim Approval of Clearview. (Reference IIM-TE-337.2 for VDOT's current Clearview Lettering policy.)

Sign lighting on non-limited access highways may be omitted even if recommended or required by Tables 1A-1B if (a) nearby residences or other "sensitive land uses" will have an unobstructed view of and be in close proximity to the luminaires, and (b) is approved by the District Traffic Engineer. Engineering judgment is used to determine what constitutes "close proximity".

"Sensitive land uses" are any land use that is Activity Categories A-D as defined by VDOT's [Highway Traffic Noise Impact Analysis Manual](#).

## Section 2 – Unencumbered Sight Distance (USD) Determination

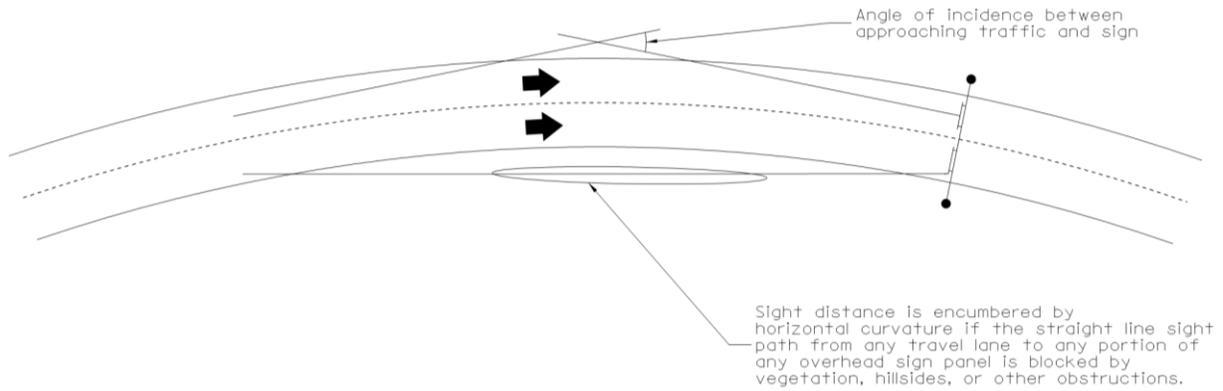
Unencumbered sight distance is defined as continuous sight distance that is unobstructed by horizontal curvature, vertical crest curvature, upstream overpasses, upstream overhead sign structures, or other obstructions. Unencumbered sight distance exists if drivers in all lanes can see all portions of every overhead sign panel on that structure.

Horizontal curvature encumbers sight distance if the angle of incidence for the approaching driver is  $\geq$  than 18 degrees<sup>3</sup> off the downstream sign as illustrated below.

Sag vertical curves do not affect the unencumbered sight distance determination.

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<sup>3</sup> 18 degrees is equivalent to 800 feet of distance on a curve that is approximately 2500 ft in radius.



### Section 3 – Visual Complexity Rating (VCR)

VCR is a qualitative assessment on a scale of 1-5 of the level of background visual complexity that the driver will see when approaching the sign, as per NCHRP Report 828, “Guidelines for Nighttime Visibility of Overhead Signs” (2016).

Level	Description	Representative Photo
1	<ul style="list-style-type: none"> <li>Minimal objects and light sources</li> <li>Low nighttime traffic</li> </ul>	
2	<ul style="list-style-type: none"> <li>Some Commercial activity and nearby light sources, low on the horizon</li> <li>Some nearby traffic signs</li> <li>Low nighttime traffic</li> </ul>	

<p>3</p>	<ul style="list-style-type: none"> <li>• Some illuminated billboards/commercial signs visible</li> <li>• Low to moderate nighttime traffic</li> </ul>	
<p>4</p>	<ul style="list-style-type: none"> <li>• Moderate levels of billboards/commercial signs</li> <li>• Moderate to heavy traffic</li> </ul>	
<p>5</p>	<ul style="list-style-type: none"> <li>• Heavy commercial activity with numerous billboards/commercial signs, both low and high on the horizon</li> <li>• Heavy nighttime traffic, with glare from opposing headlights visible</li> </ul>	

## Section 4 – Design Requirements for New Overhead Sign Structures

New sign structures installed without lighting do not need to be designed to support the future addition of sign lighting.

All new sign lighting installed via construction contract shall be Light-Emitting Diode (LED) luminaires with 3000K Correlated Color Temperature (CCT).

LED luminaires shall use illumination levels approximately equivalent to 75W~100W High Pressure Sodium (HPS). While historically VDOT has used 150W HPS luminaires, current research indicates that sign visibility is optimized by using lower illumination levels.

Historically, VDOT has equipped all sign structures that use sign lighting with luminaire retrieval systems that eliminated the need for costly lane closures for frequent HPS lighting replacement. However, LED luminaires have a much longer life span and therefore the luminaire retrieval system does not provide as substantial a benefit. Note that luminaire retrieval systems often add tens or hundreds of thousands of dollars to the cost of a sign structure; costs vary considerably depending on number of luminaires and length of span.

Therefore, designers shall consider on a case-by-case basis whether a luminaire retrieval system is appropriate for new sign structures with sign lighting. Factors to consider may include District preferences, roadway ADT, complexity of the necessary lane closure operations, and number of lights on the structure.

If the designer decides to still include a luminaire retrieval system, then the system will be a separate pay item from the structure itself.

Special design considerations may apply for proposed overhead sign lighting located within airport runway approach areas.

## Section 5 – Decommissioning of Sign Lighting on Existing Sign Structures

Prior to replacing or completely overlaying existing overhead signs attached to structures with sign lighting, the District shall prepare an evaluation of whether the existing sign lighting will still be warranted as per this IIM. Sign lighting deemed to be unwarranted shall be decommissioned when the sign is replaced. Decommissioning involves deactivation of the lights so they no longer illuminate the sign. It is typically not necessary to physically remove the lights or other physical infrastructure (cables, luminaire hanger arms, etc.).

When an engineering study identifies a candidate location for sign lighting decommissioning, it is recommended that the following procedure be used:

- A qualitative nighttime assessment should be made of the unlit signs shortly after the sign lighting is decommissioned. This nighttime assessment will evaluate whether the legibility of the unlit sign has been unacceptably compromised.
- If the qualitative assessment determines that the sign's legibility has been unacceptably compromised, then the sign lighting should be recommissioned when practical.
- If the qualitative assessment determines that the sign still has adequate legibility without the sign lighting, then the existing luminaires may be scheduled for removal. The horizontal luminaire hanger arms may be left in place.

## **REFERENCE**

- 2009 MUTCD
- [2011 Virginia Supplement to the MUTCD With Revisions](#)
- VDOT [Road & Bridge Standards](#) – Standard OSS-1
- NCHRP Report 828, [Guidelines for Nighttime Visibility of Overhead Guide Signs](#).
- VDOT [LED Lighting Special Provision](#)
- VDOT [Traffic Engineering Design Manual](#)