

# North Dakota Department of Transportation

## Lighting Warrant Policy

March 2015

This policy outlines the warrants under which NDDOT may install lighting. An engineering study should be completed using the following warrants. Policy regarding maintenance and operation of the lighting can be found in Executive Policy II 8-1.1 and II 8-1. Some terms used in this policy are defined below:

Freeway/Interstate = Arterial highway with full control of access. There are no at-grade intersections.

Urban = City having a population  $\geq 5,000$ .

Suburban = Within 5 miles of an urban boundary, for purposes of this lighting policy.

Rural = 5 miles or more from an urban boundary, for purposes of this lighting policy.

### **Continuous Freeway/Interstate Lighting**

Continuous Freeway/Interstate Lighting provides relatively uniform lighting on all main freeway/interstate lanes and direct connections, and provides complete interchange lighting of all interchanges within the section.

If one of the lighting warrants in the below table is satisfied, then continuous freeway/interstate lighting may be installed at the option of NDDOT.

<b>Table 1 - Warrants for Continuous Freeway/Interstate Lighting</b>	
1A	Sections in and near cities where the freeway/interstate mainline current AADT $\geq 30,000$ .
1B	Sections where three or more successive interchanges are located with an average spacing of 1.5 miles or less, and adjacent areas outside the right-of-way are substantially urban in character.
1C	Sections of two miles or more passing through a substantially developed suburban or urban area in which one or more of the following conditions exist. <ol style="list-style-type: none"><li>1) Local traffic operates on a complete street grid having some form of street lighting, parts of which are visible from the freeway/interstate.</li><li>2) The freeway/interstate passes through a series of developments that are lighted, such as: residential, commercial, industrial and civic areas, colleges, parks, terminals, etc. that include lighted roads, streets, parking areas, yards, etc.</li><li>3) Separate cross streets, either grade separations or interchange crossroads, occur with an average spacing of 0.5 miles or less, some of which are lighted as part of the local street system.</li><li>4) The freeway/interstate cross section elements, such as median and borders, are substantially reduced in width below desirable sections used in relatively open country.</li></ol>
1D	Sections between completely lighted interchanges with a crossroad-to-crossroad spacing of 1.5 miles or less.
1E	Sections where lighting is recommended based on engineering judgment as part of a traffic operations study.
1F	Sections where an existing continuous freeway/interstate lighting system is removed due to a roadway construction project.

Warrants 1A-1C were adapted from Table 3-2 of AASHTO's Roadway Lighting Design Guide (2005 Ed.)

### Complete Interchange Lighting

Complete interchange lighting provides relatively uniform lighting within the limits of an interchange, including:

- main lanes
- direct connections
- ramp terminals
- frontage road or crossroad intersections

If one of the lighting warrants in the below table is satisfied, then complete interchange lighting may be installed at the option of NDDOT.

<b>Table 2 - Warrants for Complete Interchange Lighting</b>	
2A	Where continuous freeway/interstate lighting is installed.
2B	Where the total current AADT ramp traffic entering and leaving the freeway/interstate within the interchange area $\geq$ 10,000 for urban conditions, 8,000 for suburban conditions, or 5,000 for rural conditions.
2C	Where the current AADT on the crossroad $\geq$ 10,000 for urban conditions, 8,000 for suburban conditions, or 5,000 for rural conditions.
2D	Where existing substantial commercial or industrial development that is lighted during hours of darkness is located in the immediate vicinity of the interchange, or where the crossroad is lighted for 0.5 mile or more on each side of the interchange.
2E	Where lighting is recommended based on engineering judgment as part of a traffic operations study.
2F	Where an existing complete interchange lighting system is removed due to a roadway construction project.
2G	Where a local governmental agency agrees to pay 50% of the installation costs and 100% of the maintenance and operating costs.

Warrant 2A was adapted from page 20 of AASHTO's Roadway Lighting Design Guide (2005 Ed.)

Warrants 2B-2D were adapted from Table 3-3 of AASHTO's Roadway Lighting Design Guide (2005 Ed.)

**Partial Interchange Lighting**

Partial Interchange Lighting provides illumination only of decision making areas, including:

- mainline merge and diverge areas
- ramp terminal intersections
- other areas of nighttime hazard (such as raised medians on the crossroad)

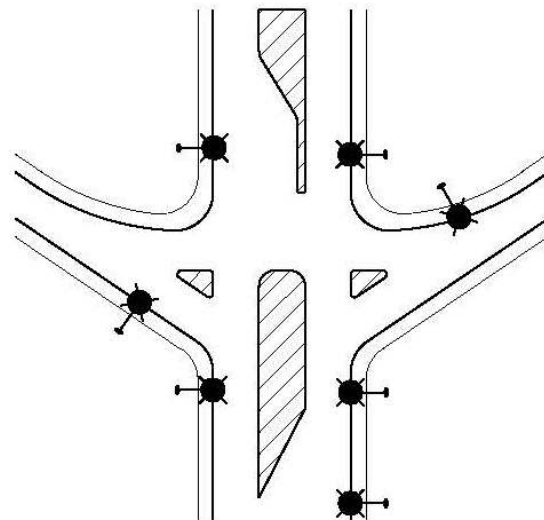
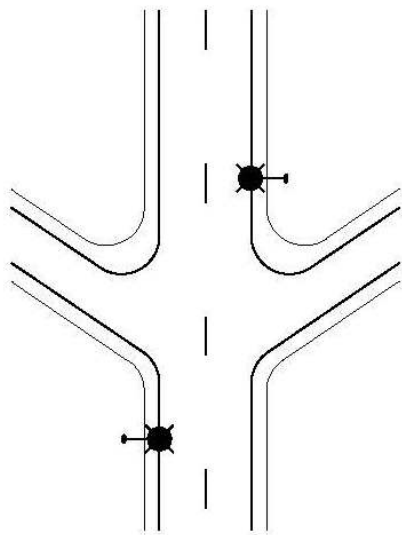
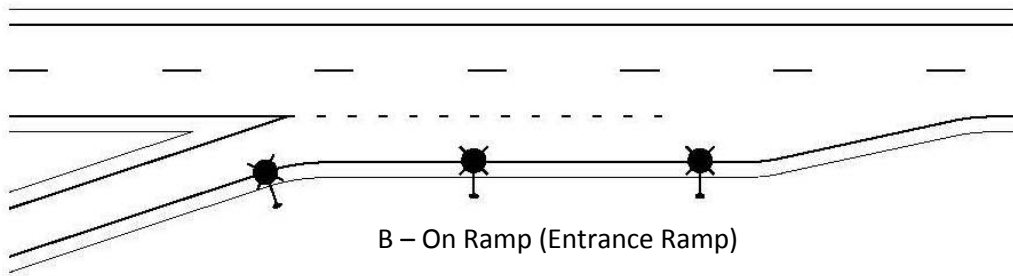
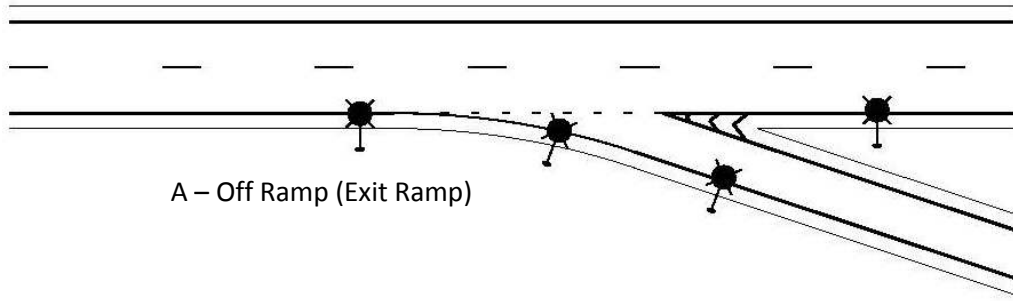
The next page shows examples of partial interchange lighting.

If one of the lighting warrants in the below table is satisfied, then partial interchange lighting may be installed at the option of NDDOT.

<b>Table 3 - Warrants for Partial Interchange Lighting</b>	
3A	Where complete interchange lighting is warranted, but not initially fully installed, a partial lighting system that exceeds the normal partial installation in number of lighting units is considered justified.
3B	Where the total current AADT ramp traffic entering and leaving the freeway/interstate within the interchange area $\geq$ 5,000 for urban conditions, 3,000 for suburban conditions, or 1,000 for rural conditions.
3C	Where the current AADT on the freeway/interstate through traffic lanes $\geq$ 25,000 for urban conditions, 20,000 for suburban conditions, or 10,000 for rural conditions.
3D	Where lighting is recommended based on engineering judgment as part of a traffic operations study.
3E	Where an existing partial interchange lighting system is removed due to a roadway construction project.
3F	Where a local governmental agency agrees to pay 50% of the installation costs and 100% of the maintenance and operating costs.

Warrant 3A was adapted from page 20 of AASHTO's Roadway Lighting Design Guide (2005 Ed.)

Warrants 3B and 3C were adapted from Table 3-4 of AASHTO's Roadway Lighting Design Guide (2005 Ed.)



Partial Interchange Lighting Examples

**Roadway Segment Lighting (Non-Freeway)**

A lighting system is provided with uniformity values and average illuminance values in accordance with the current edition of AASHTO’s Roadway Lighting Design Guide. Illumination lighting is provided at intersections within the segment.

If one of the lighting warrants in the below table is satisfied, then roadway segment lighting (non-freeway) may be installed at the option of NDDOT.

Table 4 - Warrants for Roadway Segment Lighting (non-freeway)	
4A	Sections where curb and gutter are present on at least one side of the road.
4B	Sections through cities where substantial development is present on both sides of the road and one of the below criteria is also satisfied: -The highway's <a href="#">Highway Performance Classification System</a> is Interregional or State Corridor, or -The major road current AADT (two-way volume) is 1,000 or more.
4C	Sections between two fully illuminated intersections that are spaced 0.5 mile apart or less.
4D	Sections where lighting is recommended based on engineering judgment as part of a traffic operations study.
4E	Sections where an existing roadway segment lighting system is removed due to a roadway construction project.
4F	Sections where a local governmental agency agrees to pay 50% of the installation costs and 100% of the maintenance and operating costs.

For warrant 4B, the Highway Performance Classification System map can be found on [NDDOT's Website](#) and the below questions may be considered when determining whether or not “substantial development” is present on both sides of the road:

- Is development fairly continuous for multiple blocks along both sides of the road or is it limited to isolated spot locations?
- Are significant traffic volumes generated on both sides of the road?
- Is traffic drawn from one side of the road to the other at multiple intersections (traveling perpendicular across the major road)?



↖ E/W major road. Substantial development present on both sides.

← N/S major road. Substantial development present on east side but not west side.

**Illumination Lighting at Intersections**

A lighting system is provided that illuminates the entire intersection area, through the full width turn bays and partially into the turn lane tapers. Uniformity values and average illuminance values are in accordance with the current edition of AASHTO's Roadway Lighting Design Guide.

If one of the lighting warrants in the below table is satisfied, then intersection illumination lighting may be installed at the option of NDDOT.

<b>Table 5- Warrants for Illumination Lighting at Intersections</b>	
5A	All signalized intersections.
5B	All roundabout intersections and all Restricted Crossing U-Turn intersections (a.k.a. J-Turns).
5C	Where raised channelizing islands/medians are present.
5D	Where roadway segment lighting is installed.
5E	Rural and suburban intersections where the current traffic volume cross product (Major AADT x Minor AADT) is 10,000,000 or more.
5F	Where lighting is recommended based on engineering judgment as part of a traffic operations study.
5G	Where an existing illumination lighting system is removed due to a roadway construction project.
5H	Where a local governmental agency agrees to pay 50% of the installation costs and 100% of the maintenance and operating costs.

Warrant 5C was adapted from pages 20 and 23 of AASHTO's Roadway Lighting Design Guide (2005 Ed.)

**Destination Lighting at Rural and Suburban Intersections**

Destination lighting typically consists of one wood pole street light at two-lane highway intersections and two wood pole street lights at divided highway intersections. The light alerts drivers to the presence of the intersection and can also act as a navigation reference point.

If one of the lighting warrants in the below table is satisfied, then intersection destination lighting may be installed at the option of NDDOT.

<b>Table 6 - Warrants for Destination Lighting at Rural and Suburban Intersections</b>	
6A	Where lighting is recommended based on the Highway Safety Improvement Program Implementation Plan or the Local Road Safety Program.
6B	Where the current traffic volume cross product (Major AADT x Minor AADT) is 2,000,000 or more.
6C	Where an overhead span-wire flashing beacon system is removed.
6D	Where lighting is recommended based on engineering judgment as part of a traffic operations study.
6E	Where an existing destination lighting system is removed due to a roadway construction project.
6F	Where a local governmental agency agrees to pay 50% of the installation costs and 100% of the maintenance and operating costs.