Illumination Design Supplement

Published February, 2018
Based on 2007 Training Materials
How to place Luminance & Veiling Luminance Grids

Single-Lane Off-Connection
(The Design Area May Be Shifted up to 100 Feet From the Beginning of the Wide Line)

Two-Lane Off-Connection
(The Design Area Can Be Shifted up to 100 Feet From the Beginning of the Wide Line)
How to place Luminance & Veiling Luminance Grids

**Single-Lane On-Connection**
(The Design Area May Be Shifted up to 100 Feet From the 10-Foot-Wide Ramp Point)

**Two-Lane On-Connection**
(The Design Area May Be Shifted up to 100 Feet From the 22-Foot-Wide Ramp Point)
How to place Luminance & Veiling Luminance Grids

Auxiliary Lane at On-Connection
(The Design Area May Be Shifted up to 100 Feet From the 10-Foot-Wide Ramp Point)

End of Lane and Beginning of Wide Line
(The Design Area May Be Shifted up to 100 Feet From the End of Lane and the Beginning of Wide Line)
How to place Luminance & Veiling Luminance Grids

Grid 1
Ramp must be tangent for 272 feet or do not calculate veiling luminance

Grid 2

Grid 3
How to place Luminance & Veiling Luminance Grids

Approach roadway must be tangent for 272 feet or do not calculate veiling luminance.

Direction of travel

Grid 1

For concept only - see DM Exhibit 1040-3
How to place Luminance & Veiling Luminance Grids

Grid 1
- Double Wide Lane Line or Barrier Line
- HOT Lane
- Design Area (Typ.)

Grid 2
- Enter/Exit Zone Distance Varies (Typ. 1500')
- Extend Design Area 50 ft. Beyond End of Barrier or Striping
- HOT Lane
- Double Wide Lane Line or Barrier Line

Direction of travel

DM Exhibit 1040-4a
How to place Luminance & Veiling Luminance Grids
How to place Luminance & Veiling Luminance Grids

Approach roadway must be tangent for 272 feet or do not calculate veiling luminance.
How to place Luminance & Veiling Luminance Grids

Four-Way Intersection
(Without Left-Turn Channelization)

Marked or Unmarked Crosswalk

Design Area

Multilane (Major) Roadway

Major Tee Intersection
(Without Left-Turn Channelization)
How to place Luminance & Veiling Luminance Grids

Alternate for Raised Channelization
How to place Luminance & Veiling Luminance Grids

Grid 1

Grid 2

Grid 3

Grid 4

Notes:
1. Exclude truck apron from lighting calculation.
2. Exclude the portion inside the 2 feet offset areas of the raised channelization islands from lighting calculation.
3. All channelization 2 feet wide or less in Design Area to be included in lighting calculation.

For concept only - see DM Exhibit 1040-9
How to place Luminance & Veiling Luminance Grids

Grid 1

Grid 2

Design Area

Railroad Track

Light Standard (Typ.)

Railroad Signal or Gate (Typ.)

50 ft. Min.
How to place Luminance & Veiling Luminance Grids

X = Distance From Nose of Divider to Crosswalk (1st Case) or 40 ft. Min. (2nd Case)

Design Area (Typ.)

Stop Line (Typ.)

Sidewalk

Planting Strip

2nd Case

40 ft. Min. (Typ.)

50 ft. Min. (Typ.)

Two-Way Left-Turn Lane

Raised Median Section

Grid 1

5 ft. Min. (Typ.)

Grid 2

Location of Future Pedestrian Signal (Typ.)
How to place Luminance & Veiling Luminance Grids

Grid 1
How to place Luminance & Veiling Luminance Grids

Grid 1

Grid 2

Grid 3

Grid 4

Grid 5

Grid 6
How to place Luminance & Veiling Luminance Grids

Grid 1
(diverge point from mainline)

Grid 2
Grid 3

Grid 4

Grid 5

Grid 6
(merge point at mainline)
How to place Luminance & Veiling Luminance Grids

Design Area

Full Width Chain-Up Parking Area

Grid 1

0.9 fc

1.6 fc
How to place Luminance & Veiling Luminance Grids

Grid 1
- Splitter Island (Typ.)
- Design Area (Typ.)

Grid 2

For speeds 45 mph or more: \( L = WS \)
For speeds less than 45 mph: \( L = WS/60 \)

\( L = \) Taper length in feet
\( W = \) Width of offset in feet
\( S = \) Posted speed
Use only where continuous illumination has been approved.

Ramp must be tangent for 272 feet or do not calculate veiling luminance.

Grid 1

Design Area

Match to On-Connection Design Area

Match to Off-Connection Design Area

How to place Luminance & Veiling Luminance Grids
What’s new in illumination design (or not so new) - continued

• Placement of Light Standards.
  – Luminaires should be placed as far back from the traveled way as is practical, generally 16’ from the fog stripe. Luminaires should not be placed; in ditches, in ecology embankments, on steep cut slopes, above buried utilities, below overhead utilities, or within 10’ (measured circumferentially) of power wires - including the neutral (depending on the voltage of the line the distance may be greater than 10 feet).
  – Watch your wetlands!
Example 1
Example 1
Example 2

Luminaire #34

Luminaire #35

R/W line

POLE AND LUMINAIRE SCHEDULE

<table>
<thead>
<tr>
<th>POLE NO.</th>
<th>DIST. TYPE</th>
<th>STATION</th>
<th>LOCATION</th>
<th>Offset</th>
<th>LUMINAIRE TYPE</th>
<th>MAST ARM</th>
<th>HT</th>
<th>POLE BASE TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>III</td>
<td>36-EB STA 70+65.00</td>
<td>30.00' LT</td>
<td>400 HPS</td>
<td>14'</td>
<td>40'</td>
<td>BREAKAWAY</td>
<td>PROVIDE MULTIVOLTAGE BALLAST</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>III</td>
<td>36-EB STA 73+04.00</td>
<td>40.00' LT</td>
<td>400 HPS</td>
<td>14'</td>
<td>40'</td>
<td>BREAKAWAY</td>
<td>PROVIDE MULTIVOLTAGE BALLAST</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>III</td>
<td>36-EB STA 75+50.00</td>
<td>65.00' LT</td>
<td>500 HPS</td>
<td>14'</td>
<td>40'</td>
<td>BREAKAWAY</td>
<td>PROVIDE MULTIVOLTAGE BALLAST</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>III</td>
<td>36-EB STA 78+10.00</td>
<td>60.00' LT</td>
<td>400 HPS</td>
<td>14'</td>
<td>40'</td>
<td>BREAKAWAY</td>
<td>MULTIVOLTAGE BALLAST</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>III</td>
<td>WB STA 326+32.00</td>
<td>43.00' RT</td>
<td>400 HPS</td>
<td>16'</td>
<td>40'</td>
<td>BREAKAWAY</td>
<td>PROVIDE MULTIVOLT BALLAST &amp; INDIVIDUAL PHOTOCELL</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>III</td>
<td>WB STA 328+52.00</td>
<td>60.00' RT</td>
<td>400 HPS</td>
<td>16'</td>
<td>40'</td>
<td>BREAKAWAY</td>
<td>PROVIDE MULTIVOLT BALLAST &amp; INDIVIDUAL PHOTOCELL</td>
<td></td>
</tr>
</tbody>
</table>
Example 2
Example 2
Is the signpost plumb or is the luminaire plumb?

Example 3
Example 3
Example 4
Example 4
I met with [missing text] and we probed and took measurements of several foundations where the ecology embankment has been installed behind the foundation.

These are on the off ramp from SR [missing text] to 244 Ave. SE. The measurements are taken from top of foundation to the depth that we could push the bar down into the material. We probed the sides also and they stayed fairly consistent at 8 inches of unstable material on the surface. Pole base number [missing text] Depth of unstable material at 2-ft. 4-inches back of foundation and 1-foot back of foundation

<table>
<thead>
<tr>
<th>#</th>
<th>Depth</th>
<th>Back Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>4'5&quot;</td>
<td>2'</td>
</tr>
<tr>
<td>11</td>
<td>2'</td>
<td>1'</td>
</tr>
<tr>
<td>10</td>
<td>3'1&quot;</td>
<td>3'8&quot;</td>
</tr>
<tr>
<td>9</td>
<td>3'6&quot;</td>
<td>3'</td>
</tr>
<tr>
<td>8</td>
<td>3'</td>
<td>3'</td>
</tr>
</tbody>
</table>

The last pole we checked was on SE 200 Street at SE 257 St. This is [missing text] pole base number K 31.

# K 31 20-inches back: 3'4" of unstable material and at 36-inches back: 3' of unstable material.

I have attached 2 pictures of the foundation number 12 with the bar pushed into the ground at 2 foot 4 inches back of the foundation and a straight edge laying across the top of the foundation. The red mark on the bar is at 4-foot. This is how we took the measurements listed above.
Example 6

This person is standing on the grated inlet that was constructed (by change order) to drain the water away from the hole this traffic signal pole was built into.
The guardrail was also constructed (by change order) to keep vehicles away from the hole this traffic signal pole was built into.
Example 7

Roughly 5' 3"
Existing grade
Example 10

Luminaire #37

R/W line
Example 10
Example 10
Example 10

**Request for Information**

**Part 1: Request** (from TNC construction, subcontractors or quality control)

1. Originator: JJ Jacoby  
   Company: TNC  
   Ph #: 853-9715

2. Project Area:  
   - Gig Harbor
   - NB Substructure
   - NB Superstructure
   - Existing Bridge
   - Tacoma

3. Reference Drawing(s) or Specification(s):  
   Rev No:  
   Title of Document:  
   - GIL-005

4. Reason for the request and potential solution: (include potential cost or schedule impact)
   The luminaire pole # 37 is located at the top of a cut slope at 18' behind the fog line. The slope of the cut is approximately 1-1/2 to 1. The luminaire pole base is 3-0' diameter by 4-1/2', deep per the standard plans. This would leave the leading edge of the pole with only 2-1/2' below grade. This does not appear to be an optimal depth for the pole base.
   
   **We suggest that the pole depth be increased to 6-1/2', to compensate for the placement in the slope.**
   
   We also suggest that the pole center be relocated 2' closer to the fog line so that the luminaire avoids interferences with existing utilities at the top of the slope.

5. Requested Response Date: 9/March/2005  
   Date Sent: 7/March/2005

6. Send to TNC:  
   E-Mail: pcwheato@bechtel.com
   Fax: 253-658-1816

**Part 2: TNC Review / Response** (by TNC Construction)

7. TNC Response:

8. TNC Reviewer:  
   Date of Review:

**Part 3: Design Response**

9. Design Responder: Guillermo Sanchez  
   Company: PTG/HNTB  
   Ph#: 425.450.2543

10. Design Response or Comments:
    As coordinated with Joe Jacoby on 3/09/05.
    
    **Per the design the cut slope should have been a 2:1 slope at the location where the pole is to be installed. It is acceptable to install the luminaire pole 2 ft closer to the edge stripe. It is acceptable to increase the luminaire pole foundation depth to 6½'.**
    
    DCN GIL-005-03-01 will be issued concurrently with this response to revise the pole location and depth of foundation.

11. Design Reviewer Approval: Ray Wright  
    Date: 3/09/05

12. Design Supervisor Approval: Ben Whisler  
    Date: 3/09/05

*RFIs are not authorized change documents and cannot be used to direct a change in (sub) contract requirements. If the response has a cost or schedule impact, it is the (sub)contractor's responsibility to immediately advise TNC's Authorized Representative and follow up the notice in a "pre determined" number of days with a (sub)contractor change proposal. Work undertaken without this approval is at the (sub) contractor's risk and expense.*
Example 11

CONSTRUCTION NOTES:

3. CONSTRUCT FOUNDATION AND INSTALL LUMINAIRE STANDARD PER LUMINAIRE SCHEDULE.

26. INSTALL CONDUIT INTO EXISTING JUNCTION BOX. SPLICING NEW CIRCUIT WIRES TO EXISTING CIRCUIT "A" ILLUMINATION CONDUCTORS.

47. EXTEND FOUNDATION DEPTH 4FT. VERIFY ADDITIONAL DEPTH WITH THE ENGINEER.

<table>
<thead>
<tr>
<th>LUMINAIRE NUMBER</th>
<th>CIRCUIT</th>
<th>LOCATION</th>
<th>LUMINAIRE</th>
<th>TYPE-DISTRIBUTION-WATTAGE</th>
<th>MAST ARM</th>
<th>HI</th>
<th>BASE TYPE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>A</td>
<td>DR3 1+637.60 12.17 RT</td>
<td>N/A</td>
<td>TYPE III-MEDIUM CUT-OFF 400W HPS</td>
<td>4.9M</td>
<td>15.24M</td>
<td>FIXED</td>
<td>IN GRADE</td>
</tr>
<tr>
<td>26</td>
<td>A</td>
<td>DR3' 1+699.07 12.66 RT</td>
<td>N/A</td>
<td>TYPE III-MEDIUM CUT-OFF 400W HPS</td>
<td>4.9M</td>
<td>15.24M</td>
<td>FIXED</td>
<td>IN GRADE</td>
</tr>
</tbody>
</table>
Example 11

DR3' 1+758.00 TO DR3' 1+820.00

ROADWAY SECTION DR-1
DR3' 1+613.00 TO DR3' 1+820.00
* SEE SLOPE TABLE FOR A&B VALUES
** SEE SHEET PD3 FOR BUTT JOINT PLANING DETAIL
What’s new in illumination design (or not so new) - continued

• Cross-sections

• At every location you are installing a luminaire you need to check the roadway sections for the slope in that area. You need this information to input the mounting height of the luminaire in AGI and to know how big to make the foundation.
What’s new in illumination design (or not so new) - continued

• Reviewing luminaire locations
  – After initial luminaire locations are identified the designer needs to check to make the location will work with other design features. The designer should review the approved channelization plan, existing and proposed utility plans, existing and proposed drainage plans, existing and proposed ITS plans, existing and proposed signing plans, last minute changes / addendums and all those other items that caught you in the past. (let us know what they are and we will add them here)
Reference Materials


• ANSI/IES RP-8-14 (2014), Roadway Lighting
  (Illuminating Engineering Society)

• ANSI/IES RP-22-11 (2011), Tunnel Lighting
  (Illuminating Engineering Society)

• FHWA-SA-11-22 FHWA Lighting Handbook, August, 2012

• International Commission on Illumination (ISO/CIE)

• WSDOT Design Manual (DM) Chapter 1040
Contacts

• Keith Calais, Illumination and Signal Engineer, HQ Traffic
  - Keith.Calais@wsdot.wa.gov
  - 360-705-6986

• Flint Jackson, Traffic Electrical Systems Engineer, HQ Traffic
  - Flint.Jackson@wsdot.wa.gov
  - 360-705-7392