Considerations for LED Roadway Luminaires and Controls

Ken Taillon – SEH
Benefits of LED Roadway Lighting Over Traditional Light Sources

- Energy savings
- Maintenance savings
- Improved directionality
- Improved quality of light
Things To Think About When Specifying LED Luminaires

- Testing/Listing requirements
- Color temperature
- Light loss factor
- Life expectancy of LED’s
- Light level requirements
- Calculations Methods
- Warranty
- Controls
- Luminaire selection
Testing/Listing Requirements

- National Recognized Testing Laboratory (NRTL) UL, ETL, CSA
- Ingress Protection (ability to keep dirt and water out)
- Lumen maintenance testing (IESNA LM-79, LM-80 and TM-21)
- Photometric testing
  - Ask for actual independent test lab photometric files
Color Temperature

• Most agencies currently use a nominal correlated color temperature of 4000 to 4500K.
Light Loss Factor (LLF)

• Current practice for MnDOT is to establish a unique LLF for each luminaire based on a determined number of hours of life.

• Use TM-21 data curve to determine the LLF, and multiply by .9 for the dirt depreciation.
Life Expectancy of LED Luminaires

- Life expectancy
  - LED’s
  - Driver
  - Other components – gaskets, lensing, photocells
IES Calculation Method
Photometric Report

Roadway Optimizer - Layout 1

General:
STN 156
Roadway Standard: IES RP-3-2009
R-Table: R3 (Slightly Specular), Qo=0.07  Actual QO Value: 0.07

Roadway Layout:
Layout Type: One Row, Far Side: 1PBS
Roadway Width: 36 ft
Lanes In Direction Of Travel: 3
Driver’s Side Of Roadway: Right

Luminaire Information:
KVS-110W64214K4-R-LE2 (5)
Description: KVS-110W64214K4-R-LE2
File Name: KVS-110W64214K4-R-LE2 (G120241).les
Lumens Per Lamp: N.A.
Number Of Lamps: 1
Total Lamp Lumens: N.A.
Luminaire Lumens: 10036
Luminaire Watts: 103.92
Efficiency (%) : N.A.
Total Light Loss Factor: 0.828
Luminaire Arrangement: SINGLE
Arm Length: 1 ft
Offset: 0 ft

Luminaire Location Summary:
Coordinates in ft
Spacing – Row 1: 176

<table>
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<tr>
<th>Label</th>
<th>X-Coord</th>
<th>Y-Coord</th>
<th>Z-Coord</th>
<th>Orient</th>
<th>Tilt</th>
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<td>370</td>
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Total Number of locations: 7
Horizontal Average & Uniformity

Roadway Optimizer - Layout 1

STH 156_Illum

| 1.91 | 1.23 | 0.80 | 0.47 | 0.34 | 0.30 | 0.34 | 0.47 | 0.80 | 1.23 | 1.81 |
| 1.89 | 1.25 | 0.89 | 0.55 | 0.41 | 0.36 | 0.41 | 0.55 | 0.89 | 1.25 | 1.69 |
| 1.27 | 1.07 | 0.82 | 0.57 | 0.45 | 0.41 | 0.48 | 0.57 | 0.82 | 1.07 | 1.27 |
| 0.82 | 0.75 | 0.63 | 0.52 | 0.44 | 0.42 | 0.44 | 0.52 | 0.63 | 0.75 | 0.82 |

Illuminance (Fc)
Average = 0.8
Maximum = 1.61
 Minimum = 0.30
Avg/Min Ratio = 2.67
Max/Min Ratio = 5.33
Max/Avg Ratio = 2.16
Max Veiling Luminance Ratio

Roadway Optimizer - Layout 1

STH 156_Veil_Lum

Veiling Luminance (Cd/SqM)
Average = 0.06
Maximum = 0.14
Minimum = 0.01
Avg/Min Ratio = 6
Max/Min Ratio = 14
Max/Avg Ratio = 2.33
Max/Veiling Ratio = 0.23
Threshold Increment (TI) = 13.51
Veiling Luminance

MaxLV Ratio
Calculate it!
Warranty

• 5 years has been the standard warranty

• Many manufacturers are moving to a 10 year warranty
Luminaire Selection

• Many variations of the same fixture
  – Lumen comparisons
  – Number of LEDs
  – Drive current

• Decorative luminaire limitations

• MnDOT’s approved products list (APL)
  – Good starting point
**Admin Minnesota**  Materials Management Division

Room 112 Administration Bldg., 50 Sherhume Ave., St. Paul, MN 55155; Phone: 651.296.2800, Fax: 651.267.3996

Persons with a hearing or speech disability can contact us through the Minnesota Relay Service by dialing 711 or 1.800.627.3529.

**DATE:** JULY 12, 2013

**PRODUCT/SERVICE:** LED LUMINAIRES

**CONTRACT PERIOD:** JULY 1, 2013, THROUGH JUNE 30, 2014

**EXTENSION OPTIONS:** UP TO 48 MONTHS

**ACQUISITION MANAGEMENT SPECIALIST:** LUANN OLSON

PHONE: 651.296.2447  E-MAIL: luann.olson@state.mn.us  WEB SITE: www.mnd.admin.state.mn.us

<table>
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<tr>
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<td>B&amp;L SUPPLY INC.</td>
<td>63974</td>
<td>NET 30</td>
<td>14 - 42 Days ARO</td>
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<td>VENDOR NO.: 0000225423</td>
<td>CONTACT: Susan Blom</td>
<td>E-MAIL: <a href="mailto:sue@blsupply.com">sue@blsupply.com</a></td>
<td>PHONE: 651.648.1098</td>
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<tr>
<td>VENDOR NO.: 0000196913</td>
<td>CONTACT: Shelley Doll</td>
<td>E-MAIL: <a href="mailto:shelley.doll@graybar.com">shelley.doll@graybar.com</a></td>
<td>PHONE: 812.722.2500</td>
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<td>LACHMANSINGH</td>
<td>63972</td>
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<tr>
<td>VENDOR NO.: 0000195258</td>
<td>CONTACT: Travis Lachmansingh</td>
<td>E-MAIL: <a href="mailto:travis@carpeelectrical.com">travis@carpeelectrical.com</a></td>
<td>PHONE: 812.827.2211</td>
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<tr>
<td>VENDOR NO.: 0000243640</td>
<td>CONTACT: Roger Kaufenberg</td>
<td>E-MAIL: <a href="mailto:roger.kaufenberg@vikingelectric.com">roger.kaufenberg@vikingelectric.com</a></td>
<td>PHONE: 612.676.7012</td>
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**CONTRACT USERS.** This Contract is available to State agencies and to members of the State’s Cooperative Purchasing Venture (CPV) program at the same prices, terms, and conditions.
Contract Release: L-405(5)

COOPERATIVE PURCHASING VENTURE MEMBERS. This contract is available for use by CPV members. If these commodities or service can be better structured to help you with your business needs, let us know. We solicit your comments and suggestions to improve all of our contracts so that they may better serve your business needs. If you have a need for which no contract currently exists, or you would like to be able to use an existing state contract that is not available to CPVs, please contact us. If you have specific comments or suggestions about an individual contract you can submit those via the Contract Feedback Form.

STATE AGENCY CONTRACT USE. State agencies should make every effort to use the Contract Vendor(s) listed. However, this Contract does not prohibit State agencies from using their delegated local purchasing authority to procure similar products and services from other vendors. We solicit your comments and suggestions to improve all of our contracts so that they may better serve your business needs. If you have a need for which no contract currently exists, or you would like to be able to use an existing state contract that is not available to your agency, please contact us. If you have specific comments or suggestions about an individual contract you can submit those via the Contract Feedback Form.

AGENCY ORDERING INSTRUCTIONS. Orders are to be placed directly with the Contract Vendor. State agencies should use a Contract release order (CRO) or a blanket purchase order (BPC). The person ordering should include his or her name and phone number. Orders may be submitted via fax.

SPECIAL TERMS AND CONDITIONS

SCOPE. The purpose of this Contract is to provide a source for Light Emitting Diodes (LED) Luminaires to the Minnesota Department of Transportation (MnDOT), other State agencies and members of the Minnesota Cooperative Purchasing Venture (CPV) program on an as needed basis.

PRICES. At no time should the ordering entity pay more than the Contract price. Agencies must contact the AMS immediately and fill out a Vendor Performance Report if there is a discrepancy between the price on the invoice and the Contract price.

EMERGENCY PURCHASES. In the event the Roadway Luminaires are required sooner than the quoted delivery to maintain safe working conditions and the Contract Vendor cannot meet the delivery, the State reserves the right to purchase such requirements from any available source.

PURCHASING CARDS. Contract Vendors will accept a purchasing card for order placement in addition to accepting a purchase order, without passing the processing fees for the purchasing card back to the State. The State’s single purchase limit is $2,500.00 on the purchasing card.

SHIPPING REQUIREMENTS. All shipments must be FOB Destination.

FREIGHT CHARGES. All freight costs shall be included in the cost of the product. No additional freight charges may be added to the invoice as a separate entry.

SHIPPING INSTRUCTIONS. Luminaires must be palletized and shrink wrapped. Luminaires not shipped as stated may be rejected by the agency. Any items damaged in transit and those found to be defective shall be replaced, at no charge, upon request.

ENGINEERING SERVICE. Contract Vendors shall furnish upon request, at no additional cost, the services of a trained lighting engineer to assist the State or other participating governmental agencies with any lighting problems.

UNSPSC: 39100000 Lamps and light bulbs

REVISIONS:
07/12/13 Contract 63073 (Graybar) is amended to include American Electric products.
## LED LUMINAIRES - PRICE SCHEDULE

### B&L Supply - Contract #63574

<table>
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<tr>
<th>MANUFACTURER</th>
<th>PART NO.</th>
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### Graybar Electric Co Mpls. - Contract #63573

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### Luchnowske - Contract #63972

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<td>Cooper</td>
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### Viking Electric - Contract #63977

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Considerations for Maintenance

- Access to internal components
- Materials
- 3G Rating
- Longevity in marketplace
- Product representation
Payback

• Energy Cost
  – 35% minimum savings

• Maintenance Costs
  – Traffic control
  – Liability
  – Cost of lamps
  – Cost of ballast
  – Truck roles
Considerations

• “Equivalent” – what should this mean?
• LED does not mean no maintenance
• When should LED luminaires be replaced
• UL Listing
• Retrofit products
Lamp Retrofit Products

- UL Listing

Lighting the streets of tomorrow today!

LED Retros for HPS Cobra Head
- 70-75 watts
- 100-150 watts
- 200-250 watts
- Easy installation
- Long life
- Efficient
- Affordable
- Fast Payback

Convert your existing cobra head fixture over to LED in 5 minutes.

Give your old streetlight fixtures new life.

Step 1
Remove reflector, bulb, glass refractor and ballast.

Step 2
Install the DuroFlex unit in place of the glass refractor.

Step 3
Connect the power leads to power block and photocell.
Lighting Controls

• Benefits
  – Energy maintenance savings, works for HPS
  – Extend life & reduce light pollution

• Dimming
  – AASHTO

• Constant Light Output

• Curfews

• Multi-tap Drivers

• Programmable Drivers

• Real-time Asset Management
  – Wireless Mesh Network
  – Powerline Carrier
Programmable Drivers
Wireless Mesh Network

Smart Photocontrols  →  Gateway  →  Network Operation Center  →  Customer Portal

- Wireless Radio
- Cellular or Ethernet
- Internet

- Diagram showing components and connections of a wireless mesh network system.
Powerline Carrier
Powerline Carrier
DOE Municipal Solid State Street Lighting Consortium

• Open to municipalities, utilities and energy efficiency organizations.

• Provides model specification for LED roadway luminaires.

• Working on model specification for adaptive control and remote monitoring of LED roadway luminaires.

• Retrofit Financial Analysis Tool

http://www1.eere.energy.gov/buildings/ssl/consortium.html
Considerations for LED Roadway Luminaires and Controls

Questions