

Kansas Highway LED Illumination Manual: A Guide for the Use of LED Lighting Systems

Report Number: K-TRAN: KU-15-6 • Publication Date: December 2015

Hongyi Cai, Ph.D.

The University of Kansas

Introduction

The research project was aimed to assist the Kansas Department of Transportation (KDOT) in the development of a Highway LED Illumination Manual for guiding the upcoming implementation of successful LED roadway lighting systems in Kansas to replace the existing High Intensity Discharge (HID) roadway lighting systems.

Project Description

A prequalified products list (PQL) of 146 LED roadway luminaires was collected and evaluated over 28 specifications. All products were then tested via computer simulations in the AGi32 software for optimized roadway layout and luminaire placement and the performance of illuminance and uniformity calculations. Based on this acceptance testing, an approved products list (APL) of 83 luminaires was compiled, which met the requirements for Kansas uses. To provide Kansas with a short list of luminaires intended to be highly recommended, this APL was further reduced to 13 standard pole and three high-mast LED luminaires based on their efficacy, technological innovation, availability of manufacturer sales representative, and payback time period for roadway implementation in Kansas.



Sag lens



Flat lens



Individual lens on each LED module

Different Types of Lenses Commonly Specified for Roadway Luminaires

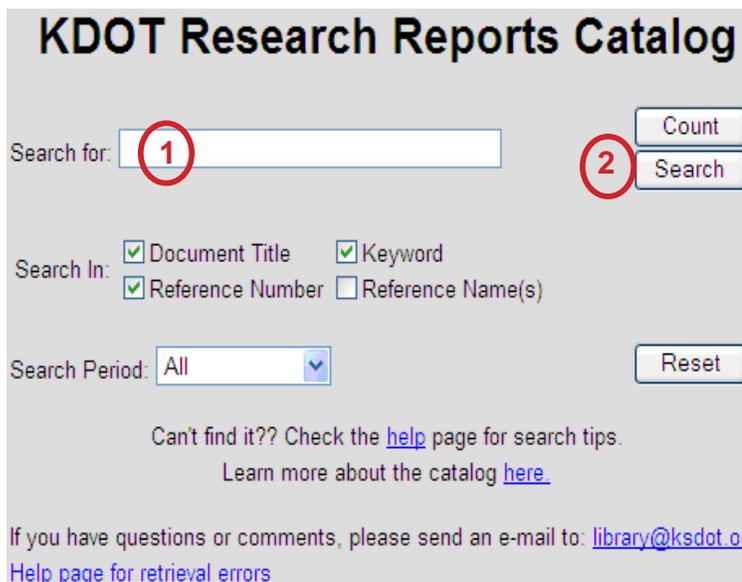
Project Results

The new Kansas Highway LED Illumination Manual will assist Kansas in the implementation of the selected LED roadway lighting systems on the APL, especially the short-listed products that show the most potential for energy and total cost savings.

A lighting economics calculator was developed to compare the short list products to their equivalent existing HID (high intensity discharge) luminaire counterparts. This cost-benefit analysis revealed significant energy cost savings and 12-year life cycle cost savings for Kansas of approximately \$18.89 to \$71.22 with an average of \$47.68 per year per light over their lifecycle. The calculated average payback time period was 1.5 to 7.1 years, averagely 2.9 years. Guidelines on the use of the selected LED illumination systems in Kansas cover the responsibilities of the KDOT divisions and districts, eligibility and warrant for installations, construction and maintenance, inspection and servicing, and lighting curfew. A pilot run program was also conducted to test and evaluate the selected LED roadway luminaires installed on K-10 over their useful life of 10-12 years.

Project Information

For information on this report, please contact Hongyi Cai, Ph.D.; The University of Kansas, 1530 W. 15th Street, Lawrence, Kansas 66045; (785) 864-2597 phone; hycai@ku.edu.



KDOT Research Reports Catalog

Search for:

Search In: Document Title Keyword
 Reference Number Reference Name(s)

Search Period:

Can't find it?? Check the [help](#) page for search tips.
Learn more about the catalog [here](#).

If you have questions or comments, please send an e-mail to: library@ksdot.org
[Help page for retrieval errors](#)

Directions for Downloading the Full Report

To download the full report, visit <http://kdotapp.ksdot.org/kdotlib/kdotlib2.aspx> and do the following:

1. Enter K-TRAN: KU-15-6 in the search box.
2. Click the Search button to the right of the search box.
3. You may have to scroll to find the specific report.
4. To download the report, click on the title of the report to open the PDF file and save it to your hard drive.

If you have any questions, please email us at library@ksdot.org.

KDOT RESEARCH