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Test Report No. LSC D134

Site Illuminance Measurements on Roadways in Welland, Ontario, for the City Of Welland

Introduction

At the request of the greenTbiz (a program of the Toronto Association of Business Improvement Areas) for the Corporation of the City of Welland, Lighting Sciences Canada took field measurements of the illumination on three roadway areas, in Welland, Ontario, to evaluate the performance of recently installed R20 and R30 LED luminaires in comparison to the existing HPS luminaires, for their greenTbiz program. The measurements were taken on a high overcast night with no moon visible in the sky during the measurements. The full details of each measurement site are described in the sections below.

The roadway illuminance measurement points and method of measurement were conducted according to IES LM-50-99 IESNA Guide for Photometric Measurement of Roadway Lighting Installations.

As a benchmark comparison, Lighting Sciences Canada was also provided with an aged R20 LED luminaire and an aged R30 LED luminaire from the site as well as one brand new R20 LED luminaire. Photometric performance reports were made of these luminaires and are detailed in other referenced reports.

Instrumentation

- Hagner EC1 Illuminance Meter

Measurement Area 1 – Fitch Street Near the Intersection of Fitch and Prince Charles Drive

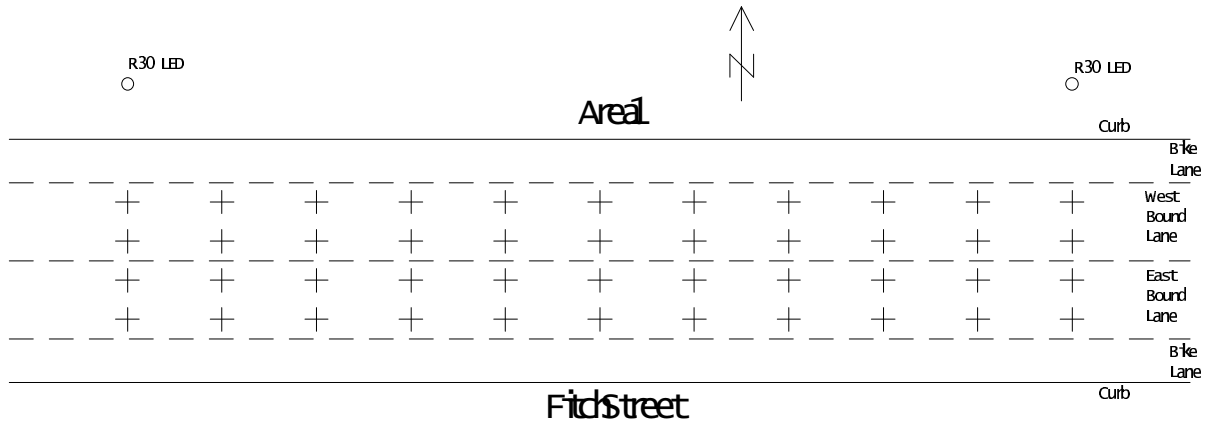
Measurement Area 1 was located between the 2nd and third poles west of the intersection with R30 LED luminaires installed. A UPS Store was located on the north side of this section of Fitch Street. There were only one set of poles regularly spaced on the north side of the street, offset 2.35 meters from the curb.

The overall roadway width was 10.36 meters from curb to curb, but each side had a 1.85 meter wide bike lane which was excluded from the measurement. There were two lanes, one west bound and one east bound, hence each lane was 3.33 meters wide. As per IES LM-50-99, measurement points were located at one-quarter and three-quarters of the lane widths. 40 meters separated the two poles bounding the measurement area. Eleven measurement points were located every 4.0 meters down the road from one pole to the next pole.

Area 1 Illumination Measurements in Lux

Point	¼ of West Bound Lane	¾ of West Bound Lane	¼ of East Bound Lane	¾ of East Bound Lane
Eastern Pole	17.3	17.2	13.1	9.6
4 m	13.4	11.9	9.4	6.9
8 m	6.2	5.8	4.8	3.9
12 m	2.7	2.6	2.5	2.2
16 m	0.8	0.8	1.1	1.3
20 m	0.6	0.6	0.8	1.0
24 m	1.8	1.8	1.9	1.9
28 m	4.2	4.2	4.0	3.4
32 m	9.6	8.9	7.3	6.3
36 m	20.4	18.1	13.9	10.3
Western Pole	25.4	24.2	18.7	13.2
Average	Maximum	Minimum	Max/Min	Average/Min
7.6	25.4	0.6	42.33	12.67

Diagram of Area 1



Measurement Area 2 – Fitch Street West of the Giant Tiger Plaza

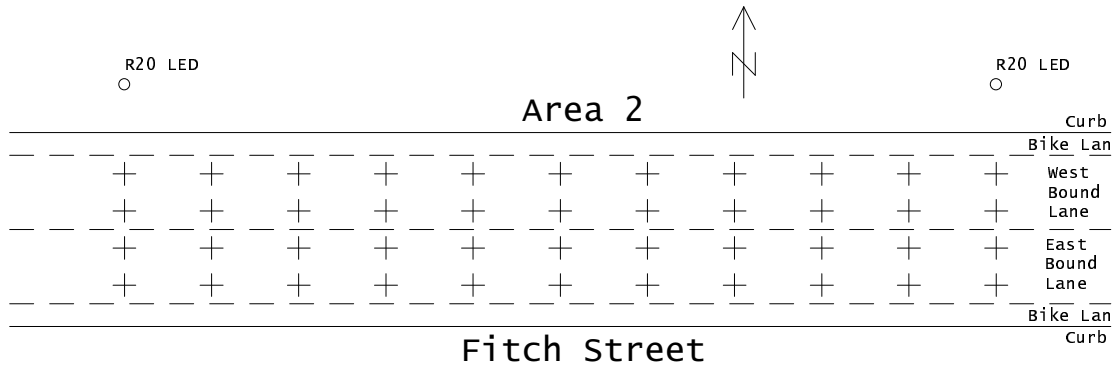
Measurement Area 2 was located between the two poles west of the Giant Tiger Plaza with R20 LED luminaires installed. The western most pole was located in front of 240 Fitch Street. There were only one set of poles regularly spaced on the north side of the street, offset 2.1 meters from the curb.

The overall roadway width was 8.5 meters from curb to curb, but each side had a 1.0 meter wide bike lane which was excluded from the measurement. There were two lanes, one west bound and one east bound, hence each lane was 3.25 meters wide. As per IES LM-50-99, measurement points were located at one-quarter and three-quarters of the lane widths. 38 meters separated the two poles bounding the measurement area. Eleven measurement points were located every 3.8 meters down the road from one pole to the next pole.

Area 2 Illumination Measurements in Lux

Point	¼ of West Bound Lane	¾ of West Bound Lane	¼ of East Bound Lane	¾ of East Bound Lane
Eastern Pole	13.8	15.9	14.8	12.4
3.8 m	11.4	11.8	10.7	8.7
7.6 m	5.9	6.1	5.9	5.2
11.4 m	2.9	3.0	3.0	2.7
15.2 m	1.2	1.4	1.5	1.6
19.0 m	0.4	0.6	0.9	1.1
22.8 m	1.2	1.4	1.6	1.6
26.6 m	2.8	2.9	2.9	2.7
30.4 m	6.0	6.2	5.6	4.9
34.2 m	11.2	11.3	10.1	8.3
Western Pole	12.6	14.8	13.8	11.7
Average	Maximum	Minimum	Max/Min	Average/Min
6.3	15.9	0.4	39.75	15.75

Diagram of Area 2



Measurement Area 3 – Claire Avenue North of Fitch Street

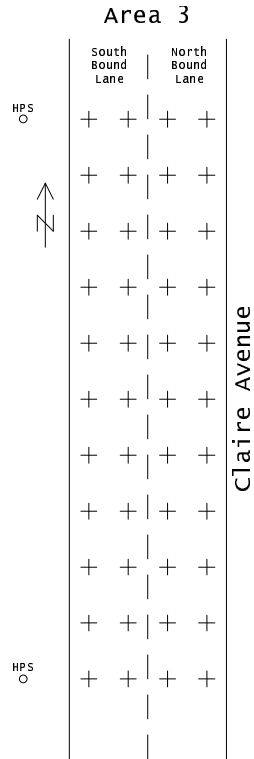
Measurement Area 2 was located between the two poles north of Fitch Street on Claire Avenue with the original HPS luminaires installed. The northern most pole was located in front of 421 Claire Avenue. There were only one set of poles regularly spaced on the north side of the street, offset 2.85 meters from the curb.

The overall roadway width was 9.8 meters from curb to curb. There were two lanes, one south bound and one north bound, hence each lane was 4.9 meters wide. As per IES LM-50-99, measurement points were located at one-quarter and three-quarters of the lane widths. 35 meters separated the two poles bounding the measurement area. Eleven measurement points were located every 3.5 meters down the road from one pole to the next pole.

Area 3 Illumination Measurements in Lux

Point	¼ of West Bound Lane	¾ of West Bound Lane	¼ of East Bound Lane	¾ of East Bound Lane
Eastern Pole	15.5	31.4	12.7	6.2
3.8 m	10.9	19.9	11.0	6.0
7.6 m	7.1	12.7	9.3	3.3
11.4 m	3.8	7.2	5.4	2.7
15.2 m	2.5	5.7	5.6	3.0
19.0 m	2.2	5.2	6.2	3.4
22.8 m	2.9	6.2	5.9	3.2
26.6 m	4.7	8.4	5.3	3.0
30.4 m	5.7	8.8	6.0	2.9
34.2 m	9.3	17.2	8.8	5.1
Western Pole	13.0	23.1	10.9	5.4
Average	Maximum	Minimum	Max/Min	Average/Min
8.1	31.4	2.2	14.27	3.68

Diagram of Area 3



In Lab Comparison of Aged and New LED Luminaires

Below is a summary of the results obtained in laboratory measurements of sample fixtures. Full reports can be found in the test reports referenced in this table.

Luminaire	Aged R30 1,000 Hours	Aged R20 1,000 Hours	New R20
Photometric Test Report Number	LSC D096	LSC D095	LSC D097
Light Output (Lumens)	4343	3818	3293
CIE 1931 x	0.317	0.304	0.321
CIE 1931 y	0.341	0.328	0.343
CCT	6233 °K	7005 °K	5991 °K
CRI	71.5%	71.5%	71.3%

Prepared For: **The City of Welland
Welland, Ontario**

Date: February 25, 2008

**Upon Request from:
Toronto Association of Business Improvement Areas
greenTbiz Program**

Prepared By:



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