

Case Study for FMV

With the advent of LED solid lighting technology coming into the residential and commercial markets, smart building owners and property managers are gradually retrofitting their common area fluorescent lighting systems with LED lighting for the simple economic and environmental goal of reducing whole building electricity consumption, operating costs and at the same time shrinking their environmental foot print. Other advantages of the LED lighting retrofit proposal include much longer life expectancy of the new LED light compared to existing fluorescent tubes. A typical LED tube is more than triple the lifespan of the average fluorescent lamp, thereby further saving on operating and maintenance costs in the long run. In addition, current fluorescent lamp technology contains small amount of mercury, whereas LED tubes are environmentally friendly and contain no mercury or other hazardous materials.

Introducing GLL LED Tube with Sensor

Globe LED Lighting's (GLL) LED tube with sensor, is the latest inventive breakthrough in the commercial lighting market, and is specialized for underground parking garages, common hallways, and stairwells. It is bright enough for people to feel safe walking through, as well as for drivers to navigate and park their vehicle under. It changes to eco mode (3W, 6W or 9W) automatically when there is no vehicle or human movement, and still provides enough brightness or minimum lumens for monitoring purpose and meeting all municipal code requirements. The electricity consumption of this LED tube with sensor is only 19% of a typical T8 fluorescent lamp. The regular LED tube's lifespan is around 50,000 hours. The GLL LED tube with sensor has a longer lifespan than regular LED's because with the sensor, the LEDs work under a condition of low power most of the time. Through numerous trials and testing, this technology has been proven to save energy while still maintaining bright conditions.

Introducing Repairable GLL LED Tube

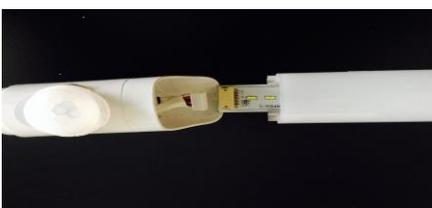
Another unique feature of GLL LED tube with sensor, is that it is repairable. Roughly 70% of the cost in producing these tubes is found in the LED chips, which usually have a very long lifespan. The rest is attributed to the sensor and electronic adapter, where most of the problems occur. GLL LED tube's modularized design gives it another advantage of simple repair, rather than replacing the entire tube completely. This leads to another environmental pro: decreased waste.

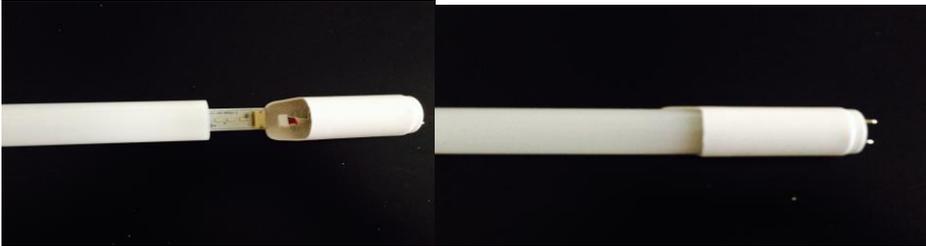
The sensor parts (please see P1). The adapter parts (please see P3).

The adapter and sensor parts are connected to LED chips with plug.

P1

P2





1. Summary

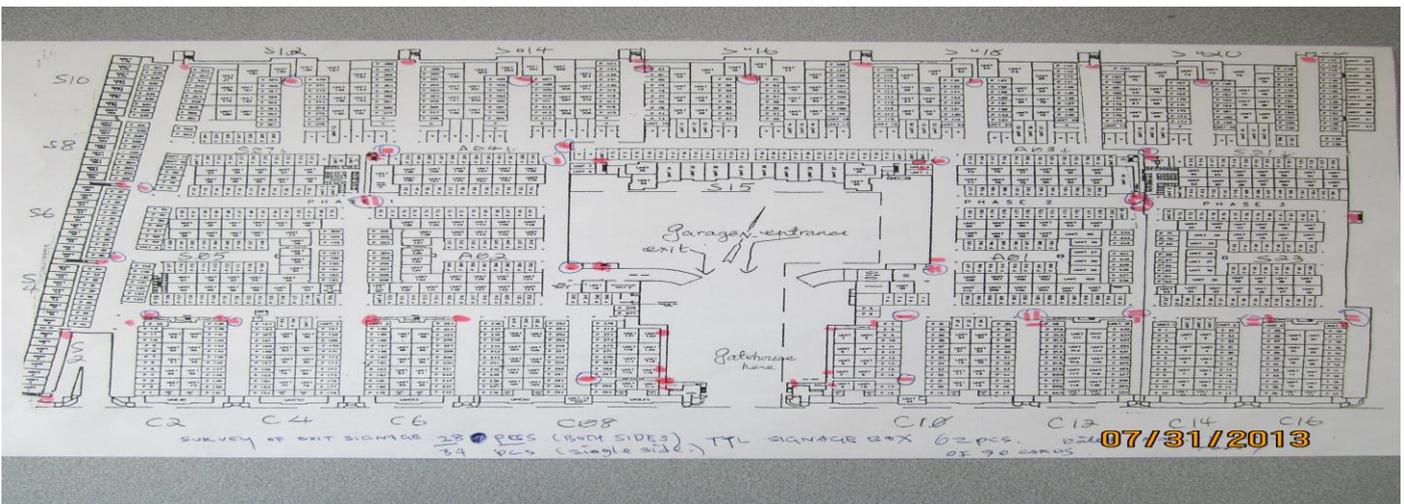
The latest inventive design of GLL LED tubes with sensor made it great for applications like underground parking lots, stairwells, and corridors. The following savings can be achieved if FMV replaced all the T12 8' fluorescent lamps in underground parking lot to GLL LED tubes.

- A. The annual energy savings: **1,037,640.98KWH**
- B. The annual economical savings: **\$141,368.32**
- C. The project cost: **\$212,104.35**
- D. Incentives: **\$41,127.5(Ontario)**
- E. The payback period: **1 year and 2 months**

2. Background

First Markham Village (FMV) is a townhouse complex located at 8 Cox Blvd, Markham ON L3R 4G1, near HWY 7E and Warden Avenue. FMV has a big underground parking lot which has a capacity for 800 cars. There are 895pcs of 110w T12 8' fluorescent lamp and 284pcs of 60w T12 4' fluorescent lamp. The lighting system is an old system that consumes a huge amount of energy, and the voltage of the lighting system is 347V.

The Map of Underground Parking Lot at FMV



Globe LED Lighting Inc. (GLL) has installed 2 portable power meters at parking stall #85 and #87 on Dec 16, 2013 to track the electricity consumption of two T8 4' LED tubes with sensor and one 110w T12 8' fluorescent lamp.

3. Portable Power Meter

- A. The portable power meter was installed to monitor two 18W LED tubes with sensor at #85
(Full power 18W/Eco power 6W)



- B. The portable power meter was installed to monitor one 110W T12 8' fluorescent lamp at #87
(Always 110W)



4. Actual Data from portable power meter

A. Parking stall #85(2pcs of T8 LED 4' Tube with Sensor)

Date and time	Energy Consumption	Hydro Bill
2013/12/16 13:00	The power meter was installed	
2013/12/23 11:00	1.39KWH	\$0.17
2013/12/30 12:00	2.99KWH	\$0.37
2014/01/06 13:30	4.59KWH	\$0.57
2014/01/20 12:00	7.77KWH	\$0.97
2014/02/04 13:00	11.15KWH	\$1.39
2013/02/10 15:00	12.53KWH	\$1.57
2014/02/18 13:00	14.56KWH	\$1.82
2014/03/04 14:00	17.54KWH	\$2.19
2014/03/18 15:30	20.77KWH	\$2.60

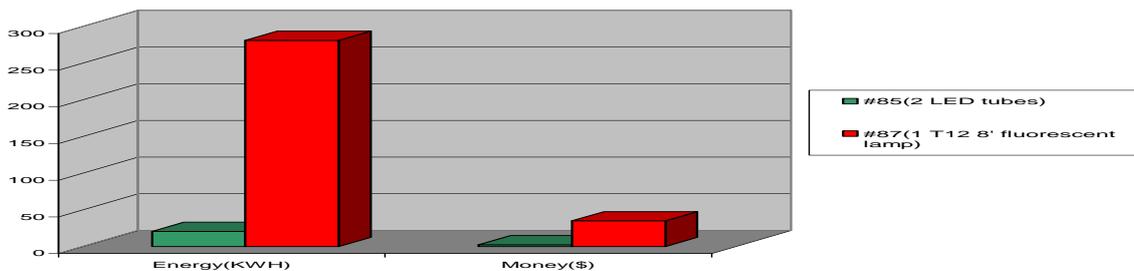
B. Parking stall #87(one T12 8' fluorescent lamp)

Date and time	Energy Consumption	Hydro Bill
2013/12/16 13:00	The power meter was installed	
2013/12/23 11:00 am	19.49KWH	\$2.44
2013/12/30 12:00	41.64KWH	\$5.21
2014/01/06 13:30	63.76KWH	\$7.97
2014/01/20 12:00	107.33KWH	\$13.42
2014/02/04 13:00	153.29KWH	\$19.16
2013/02/10 15:00	171.95KWH	\$21.49
2014/02/18 13:00	196.29KWH	\$24.54
2014/03/04 14:00	239.02KWH	\$29.88
2014/03/18 15:30	281.11KWH	\$35.14

Note: \$0.125/KWH

C. Table of Energy Consumption and Hydro Bill (in 92 days)

	#85(two LED tubes) Full Power 18W/ECO Power 6W	#87(one T12 8' fluorescent lamp) Always 110W
Energy(KWH)	20.77KWH	281.11KWH
Money(\$)	\$2.60	\$35.14



5. Analysis

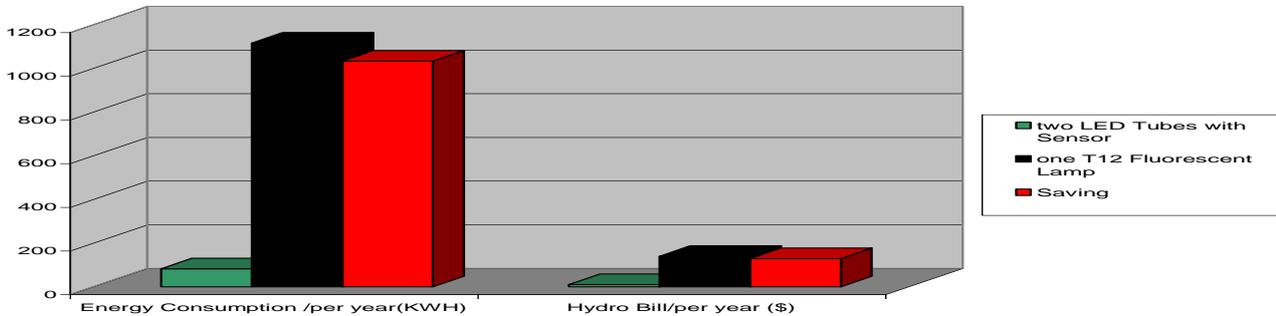
A. The Energy Consumption (daily and annual)

The electricity consumption of two 18W T8 4' LED tubes with sensor is **0.226KWH/per day** in the underground parking lot according to the actual track data(20.77kwh/92days), then annual electricity consumption is **82.49KWH/per year** (0.226KWH*365days). The annual hydro bill is \$10.31.

The electricity consumption of one 110W T12 8' fluorescent lamp is **3.056KWH/per day** in the underground parking lot according to the actual track data (281.11KWH/92days), then annual electricity consumption is **1115.44KWH/per year** (3.056 KWH*365days). The annual hydro bill is \$139.43.

Table of Energy Consumption (daily and annually)

	#85(two LED tubes with sensor) Full Power 18W/ECO Power 6W	#87(one T12 8' fluorescent lamp) Always 110W	Savings
Daily(KWH)	0.226KWH	3.056KWH	2.83KWH
Annual(KWH)	82.49KWH	1115.44KWH	1032.95KWH
Annual Hydro Bill(\$)	\$10.31	\$139.43	\$129.12



B. Project Summary

There are 895pcs of 110W T12 8' fluorescent lamps and 284pcs of 60W T12 4' fluorescent tubes in the underground parking lot at First Markham Village. If the existing fluorescent lamps were used, the annual electricity consumption and hydro bill would be as follows:

The Annual Electricity Consumption: $1115.44\text{KWH} \times (895 + 284 / 2) = 1,156,711.28\text{KWH}$

The Annual Hydro Bill: $1,156,711.28\text{KWH} \times \$0.125 = \$144,588.91$

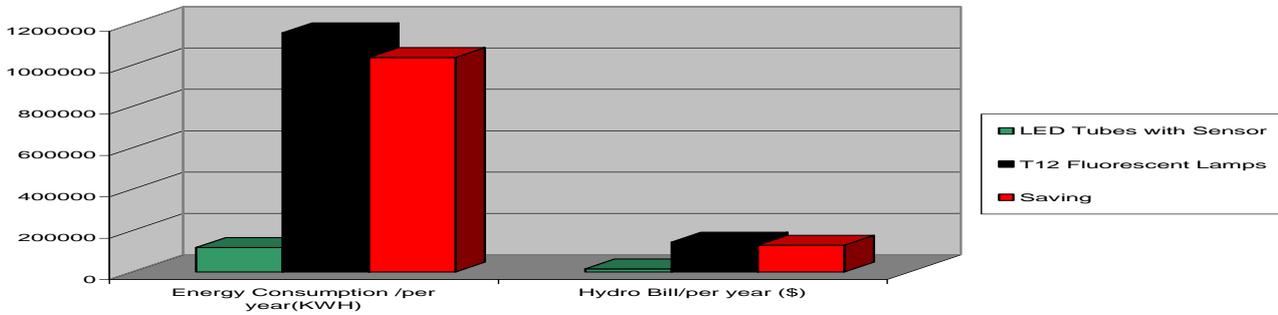
If all the lamps are going to be retrofitted with 1740pcs of 18W T8 LED tubes with sensor at parking stalls, and 300pcs of 18W T8 LED tubes without sensor at parking driveway, the annual electricity consumption and hydro bill would be:

The Annual Electricity Consumption: $82.49\text{KWH} \times (1740 / 2) + 18\text{w} \times 24\text{h} \times 365\text{d} \times 300 = 119,070.3\text{KWH}$

The Annual Hydro Bill: $119,070.3\text{KWH} \times \$0.125 = \$14,883.79$

Table of Project Annual Energy Consumption, Hydro Bill and Saving

	LED tubes with sensor	T12 Fluorescent Lamps	Saving
Annual Energy(kwh)	119,070.3KWH	1,156,711.28KWH	1,037,640.98KWH
Annual Hydro Bill (\$)	\$14,883.79	\$144,588.91	\$129,705.12



6. Finance Analysis

A. Maintenance Cost

If the lifespan of T12 8' fluorescent lamp is 30,000 hours (3.4 years), then 305pcs of T12 8' fluorescent lamp have to be replaced for every year. The price of T12 8' fluorescent lamp is \$9.98/each.

The cost of replacing lamps for one year: $305\text{pcs} * \$9.98 = \$3,043.9$

If the lifespan of ballast is 100,000 hours (11.4 years), then 90pcs of ballast have to be replaced for every year. The price of ballast (for T12 and AC347V) is \$75.97/each. The labor cost of replacing ballasts is \$20/each.

The cost of replacing ballasts for one year: $90\text{pcs} * (\$75.97 + \$20) = \$8,637.3$

The total cost of maintenance for one year: $\$3,043.9 + \$8,637.3 = \$11,681.2$

B. Project Cost

The project cost is \$212,104.35 (please see the proposal for FMV).

C. Finance Analysis

Capital Costs	\$212,104.35
Incentives	\$41,127.5
Net Capital Costs	\$170,976.85
Annual Savings	\$129,705.12
Maintenance savings	\$11,681.2
Total annual savings	\$141,368.32
Simple Payback (Yr)	1 year and 2 months

Note: The hydro bill will be increased by 30% in the next 3 years. The actual payback will be shorter.

7. Warranty.

Globe LED Lighting Inc provides 5 years warranty.