Appendices

V. Appendix A: Town of Medfield Energy Audits – Rise Engineering

Appendix A1

Columbia Gas of Massachusetts

A NiSource Company

Energy Assessment

Prepared For:

Blake Middle School

24 Pound Street, Medfield, MA 02052

Prepared By: Sam Nutter

Director Gas Program Services

RISE Engineering

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RISE ENGINEERING

Overview

Columbia Gas of Massachusetts has retained RISE Engineering to evaluate the energy consumption and potential energy efficiency measures for their commercial and industrial customers, including municipal customers. The purpose of this review is to summarize existing energy usage patterns, to highlight any issues with regard to elevated energy consumption, and to determine if there are cost-effective measures that can be implemented by the customer. Energy efficiency measures will decrease the energy consumption and may provide a favorable payback to the customer. If the recommended measures are installed or implemented, incentives may be available from Columbia Gas of Massachusetts and/or from Eversource Energy.

The savings and cost estimates in this report are engineering estimates that are based upon accepted industry practices. These are estimates, not savings guarantees or installation quotations. Prior to moving to installation or construction, additional testing, measurement, or verification may be required to further refine the savings estimates. Additionally, firm quotations for the requested scope of work should also be obtained prior to making final project selections.

Finally, the utility incentives shown in this report are estimates that may change from year to year or if the final scope of work is changed from the described scope herein. Incentive levels must be confirmed by the applicable utility prior to the commencement of construction or implementation of the recommended measures.

Facility / Project Information

Blake Middle School, 24 Pound Street, Medfield, MA 02052

Site Contact: Michael LaFrancesca (mlafrancesca@email.medfield.net)
Columbia Gas Contact: Ernie Robinson (erobinson@nisource.com) (508) 580-0100 ext. 1357
Eversource Contact: Steve Grattan (Steven.Grattan@eversource.com) 781-441-8243

Energy Usage (past 12 months):	Natural Gas: 56,537 therms
	Electricity: 697,181 kWh
Total Conditioned Space:	99,217 sq.ft. (per Medfield Tax Assessor database)
Heating Use index:	0.57 therms/ft^2/yr. (57 kBtu/ft^2/yr.)
Energy Use Intensity (EUI) index:	81.0 kBtu/ft^2/yr.

Benchmarking

According to the U.S. Department of Energy's Commercial Reference Buildings nationwide benchmark data, primary schools in this climate zone have an average EUI of 81 kBtu/ft^2/yr whereas secondary schools in this climate zone have an average EUI of 88 kBtu/ft2/yr. Therefore, Blake Middle School has an average energy efficiency rating compared to its peer schools in similar climate zones. For the heating energy portion, secondary school buildings in similar climate zones typically have a Heating Use index in the range of 0.54 therms/ft^2/yr, or about 54 kBtu/ft^2/yr. The higher heating index value for the Blake Middle School indicates this building is above the average range for similar buildings which shows that the building is less efficient in its current state. There are opportunities for efficiency improvements as described in the following sections.

Summary Table of Energy Efficiency Opportunities

Medfield Blake Middle School						10/21/2016
Measure Description	Estimated Cost	Annual Therm Savings	Annual kWh Savings	Annual Energy $ Savings	Total Estimated Incentive	Estimated Net Cost
EMS retrocommissioning	TBD	2,754	2,008	$3,158	TBD	TBD
Showerheads	$350	265		$305	$350	$0
Faucet Aerators	$220	340		$391	$220	$0
Spray Valve	$150	114		$131	$150	$0
New DHW Storage Tank	$8,000	1,050		$1,202	$4,000	$4,000
Roof Insulation	$100,000	6,212	1,111	$7,144	$50,000	$50,000
Interior Lighting 200 side	$66,114		64,146	$10,584	$16,037	$50,077
Interior Lighting 100-300 side	$98,790		106,267	$17,534	$25,527	$73,263
Exterior Lighting	$35,082		67,180	$11,085	$16,795	$18,287

Facility Overview

This building was the former High School which was renovated starting in about 2003 and which became the Blake Middle School when the new high school was completed. Unlike the High School renovation, this was a more modest project. There was an addition included in the renovation. Most of the original mechanical equipment, lighting, and other building systems were left in place in the original school. The Blake Middle School only has limited cooling systems for areas such as the Library, the IT Dept., and some office areas.

The HVAC mechanical equipment includes:

- A Trane Tracer Summit V14 energy management system (EMS) was installed during the addition/renovation. This is the same system that manages the high school. The computer interface is in the high school facilities office.
- A Trane CO_2 monitoring and control system was installed in July 2009 with sensors in classroom and other areas.
- Primary heating is provided by 2 cast iron sectional hot water boilers with natural gas fired power flame burners rated at 5,845 MBH input each
- 13 packaged RTUs/AHUs/MU air provide supplemental (gas) heat; Only 3 provide cooling (Library & Admin)
- 35 unit ventilators primarily located in classrooms
- Some limited fin tube radiation heating
- The original pneumatic controls were left in place but connected to the EMS with electronic acutators

The existing lighting is mostly T-8 lamps with electronic ballasts. There are also high output T-5 lamps in the gymnasium and cafeteria. The auditorium had new lighting installed last year. The cafeteria also had new lighting installed last year. RISE Engineering completed a full room-by-room lighting audit on 10/4/16. The detailed results and recommendations from that lighting audit were presented in a separate report.

Energy Efficiency Opportunities

Retro-commissioning to the EMS. Although the Trane Tracer Summit EMS system was installed relatively recently, it has not been fully maintained to provide optimal performance. The current facilities staff were not part of the original commissioning and training process 10 +/- years ago and therefore do not know how to maximize operation of the system to achieve highest efficiency. Finally, due to improvements in technology over the past 10-12 years, the front-end interface for the system is rather outdated and difficult to access and operate. Therefore, it is highly recommended that Medfield perform a comprehensive retro-commissioning of the EMS system that includes a thorough and well documented training program for all the key facilities staff and managers.

A thorough retro-commissioning will include identifying the full extent of existing deficiencies, developing an action plan to remedy those deficiencies, implementing the approved repairs or upgrades, and subsequently training the end users on optimal system operation. The cost of the retro-commissioning services will need to be established via a bidding process.

Since identifying the full extent of existing deficiencies is beyond the scope of an energy assessment, the savings shown in this report are a conservative estimate based upon regaining better control of schedules and temperatures. During the retro-commissioning process, additional savings opportunities will likely be identified.

Utility incentives for retro-commissioning are evaluated on a case by case basis, therefore any applicable incentive would be established as the project moves forward. These are often done on a performance basis and paid after the savings estimates have been proven over time.

Upgrades to the EMS

The EMS commissioning project that was undertaken at the high school and completed in April 2006 did not seem to address the Blake Middle School, even though both schools are controlled by the same system. The retro-commissioning process will determine which opportunities exist. One potential opportunity may be to eliminate the pneumatic controls throughout the school and convert it fully to direct digital control (DDC) system. This type of conversion would likely have installed costs in the range of $150,000. Since there is an existing EMS, such a conversion may not be fully eligible for utility incentives. However, if the conversion includes adding “points” to the EMS in order to better monitor and/or control HVAC systems, those elements of the upgrade are likely to be eligible for EMS incentives. As noted in the high school report, another upgrade that is recommended would be a new front-end interface. Currently, an EMS system operator must sit in a facilities office at the high school on a desktop computer – there is no ability to monitor or control the system from the middle school itself or from other remote locations. Modern EMS controls can be accessed remotely via computers, tablets, or even cellphones which provides much better access for facilities managers and staff.

HVAC Improvements

One of the two air handling units (AHUs) for the Library is shut down and non-functional. As a result, the remaining AHU is operated continuously to try to keep the Library comfortable. It was reported that that air conditioning in this zone is left on 24/7 in the summer to try to keep up but even with that approach there are comfort issues. Also, the Librarian’s office lacks adequate distribution or controls from the HVAC system and, as a result, overheats excessively in warm weather. Similar problems were reported in the Nurse’s area. It is not within the scope of an energy assessment to fully evaluate design and/or maintenance issues with an HVAC system. However, it is very likely that repairs and improvements to these systems will not only improve comfort for the occupants, but are likely to improve efficiency and may qualify for utility incentives.

Low Flow Showerheads

The showerheads in the locker rooms should be upgraded with low-flow showerheads rated at 1.5 GPM. These save hot water which saves natural gas for heating the water. The cost savings in this report are based on the natural gas cost savings only. However, each low flow showerhead is estimated to also save over 7,000 gallons of water per year. Columbia Gas typically fully subsidizes this measure (pays 100% of the installed cost) for the stock low flow showerheads if installed by RISE staff, or will typically pay up to 50% of the cost for custom or premium showerheads.

Low Flow Faucet Aerators

The faucet aerators in the rest rooms and locker rooms should be upgraded with low-flow aerators rated at 1.5 GPM, or less. These save hot water, and natural gas as well. The cost savings in this report are based on the natural gas cost savings only. However, each low flow aerator is estimated to also save over 5,000 gallons of water per year. Columbia Gas typically pays 100% of the cost of this measure if RISE staff installs the low flow aerators.

High Performance Spray Valves

Spray valves are used in commercial kitchens, such as those found in school cafeterias, to pre-rinse items before they go through the dishwasher. High performance spray valves that use less hot water are available through the MassSave program. Columbia Gas typically fully subsidizes these when installed by RISE staff. The efficient spray valves can be installed at the same time as the aerators and showerheads.

New DHW Storage Tank

As noted previously, this building was originally built in the 1960's as the high school. In that era, students showered after gym classes and also after sports team practices and games. To meet that load, plus other hot water loads for the cafeteria, the school was built with two domestic hot water (DHW) storage tanks rated at approximately 940 gallons each. The portion of the natural gas load to keep these tanks hot during the summer months is about 150 – 200 therms per month. Abandoning those tanks and replacing them with a modern, highly insulated, DHW tank (or tanks) that is (or are) properly sized for the current loads will save approximately 1,000 therms of gas per year. The energy savings and price shown in the summary table are engineering estimates that must be confirmed prior to proceeding to construction of this measure as part of the final design process. Similarly, any potential incentive for this Custom measure must be confirmed with Columbia Gas once the firm price and final savings estimate are determined.

Roof Insulation

It was reported that the Blake Middle School roof is subject to leaks and that the roof is at or near the end of its useful life. This measure recommends adding R-7 of insulation (beyond the typical amount of insulation used during re-roofing) during the roof replacement. The savings estimate assumes the entire roof (approximately 99,000 sq. ft.) will be replaced and have the extra insulation added. The price shown is an engineering estimate that must be confirmed prior to proceeding with this measure. Similarly, any potential incentive for this Custom measure must be confirmed with Columbia Gas and with Eversource (for the air conditioning savings) once the firm price and final savings estimate are determined.

Energy Efficient Commercial Food Service Equipment

Although not detailed in this report, it was reported during the site visit that the school's cafeteria equipment is nearing the end of life and may need to be replaced. Both Columbia Gas and Eversource offer prescriptive incentives for high efficiency commercial kitchen equipment. The rebates range from $100 to as high as $2,000 for equipment such as high efficiency ovens, Energy Star steamers, commercial dishwashers, ice machines, or hot food holding cabinets. Rebate forms can be downloaded from the Mass Save website: http://www.masssave.com/en/business/eligible-equipment/food-service

Summary and Next Steps

Any prescriptive measures presented here, such as showerheads, aerators, or spray valves have established savings, costs, and incentive levels and can proceed to implementation at any time. Similarly, the lighting measures proposed by RISE (see separate reports) have had the savings, costs, and incentives established and confirmed by the utility program administrators and can proceed to construction at any time.

As noted previously, any custom gas efficiency measures, such as upgrades or retro-commissioning of an EMS system, installing new DHW tank(s), or adding extra insulation during re-roofing, will need further analysis and vetting with the applicable utility program administrators before proceeding to construction. The prices for such custom measures should be confirmed shortly before any planned installations as the costs shown in this report are engineering estimates and are subject to change over time.

RISE Engineering

RISE Engineering, a division of Thielsch Engineering, Inc. ("RISE"), prepared this energy assessment on behalf of Columbia Gas of Massachusetts, and the MassSave energy efficiency programs. RISE has provided services to natural gas and electric utilities and their customers since 1997. RISE maintains a full time dedicated staff at appropriate levels to meet the needs of the Massachusetts energy efficiency programs and to complete energy efficiency projects for end user customers. RISE provides services throughout New England and New York from our central office in Cranston, RI, as well as from local offices in Canton, MA and South Yarmouth, MA. RISE services include: energy assessments, energy engineering, direct installations of efficiency measures, project management of custom projects, and turn-key installation services including HVAC, weatherization, and electrical measures.

Appendix A2

RISE ENGINEERING™
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EVERSOURCE

Blake Middle School LED Lighting Upgrades

LED TUBES/BYPASS BALLASTS, LED RECESSED FLAT PANELS & EXTERIOR LED

Financial Summary

Total Project Cost	**$**	**199,986**
Estimated Electric Incentive	**$**	**(59,398)**
Customer Net Cost	**$**	**140,588**
Estimated Energy Cost Savings Annually	**$**	**39,203**
Estimated Maintenance Savings	**$**	**6,476**
Return on Investment (ROI)		**32%**
Simple Payback in Years		**3.1**

Energy Savings

kW Reduction	kWh Reduction
68.41	**237,593**

Pollution Savings

CO2 Reduction (lbs)	NOx Reduction (lbs)	SO2 Reduction (lbs)
301,030	**254.9**	**942.1**

Prepared: 10/11/2016

RISE ENGINEERING

Blake Middle School
24 Pound Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
1	BLAKE MS	BOILER ROOM	B1	1X4 2L4' T8 32W/NP INDUSTRIAL	13	4836	60	0.78	3,772	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	13	4836	28	0.36	1760			0.42	2,012
2	BLAKE MS	ROOMS 201, 203, 204	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	54	2856	60	3.24	9,253	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	54	2856	28	1.51	4318			1.73	4,935
3	BLAKE MS	ROOM 201A	I1	60W INCANDESCENT SCREW IN A LAMP	2	2856	60	0.12	343	SCREW-IN GC 9W LED A LAMP	2	2856	9	0.02	51			0.10	291
4	BLAKE MS	PRACTICE 1	C1	2X4 3L4' T8 16W LED TUBES/NP RECESSED PARABOLIC	1	2856	48	0.05	137	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	2856	30	0.03	86			0.02	51
5	BLAKE MS	LOBBY	D1	2X2 3L4' T8U 31W/NP RECESSED PARABOLIC	1	2856	88	0.09	251	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	1	2856	20	0.02	57			0.07	194
6	BLAKE MS	STORAGE 204A	B3	1X4 2L4' T8 32W/NP WRAP	2	1000	60	0.12	120	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	1000	28	0.06	56			0.06	64
7	BLAKE MS	CORRIDOR	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	17	4836	53	0.90	4,357	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	17	4836	20	0.34	1644			0.56	2,713
8	BLAKE MS	KITCHEN HALL	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	7	2856	53	0.37	1,060	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	7	2856	20	0.14	400			0.23	660
9	BLAKE MS	CUSTODIAL OFFICE	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	2	2856	88	0.18	503	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.14	434
10	BLAKE MS	ROOM 202A	B3	1X4 2L4' T8 32W/NP WRAP	2	2856	60	0.12	343	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	2856	28	0.06	160			0.06	183
11	BLAKE MS	LOCKER AREA	C1	2X4 3L4' T8 16W LED TUBES/NP RECESSED PARABOLIC	2	2856	48	0.10	274	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	2856	30	0.06	171			0.04	103
12	BLAKE MS	RESTROOMS	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	2	2856	60	0.12	343	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	2856	28	0.06	160			0.06	183
13	BLAKE MS	DRY STORAGE	B3	1X4 2L4' T8 32W/NP WRAP	4	1000	60	0.24	240	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	4	1000	28	0.11	112			0.13	128
14	BLAKE MS	KITCHEN	B5	1X4 2L4' T8 32W/NP VAPOR TIGHT KITCHEN	14	2856	60	0.84	2,399	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	14	2856	28	0.39	1120			0.45	1,279
15	BLAKE MS	KITCHEN	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
16	BLAKE MS	CORRIDOR 206	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	13	4836	53	0.69	3,332	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	13	4836	20	0.26	1257			0.43	2,075
17	BLAKE MS	ROOMS 207-209	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	36	2856	60	2.16	6,169	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	36	2856	28	1.01	2879			1.15	3,290
18	BLAKE MS	CORRIDOR	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	11	4836	53	0.58	2,819	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	11	4836	20	0.22	1064			0.36	1,755
19	BLAKE MS	ROOMS 212 & 218	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	34	2856	60	2.04	5,826	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	34	2856	28	0.95	2719			1.09	3,107
20	BLAKE MS	STORAGE	B3	1X4 2L4' T8 32W/NP WRAP	3	1000	60	0.18	180	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	3	1000	28	0.08	84			0.10	96
21	BLAKE MS	ROOM 214	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	19	2856	60	1.14	3,256	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	19	2856	28	0.53	1519			0.61	1,736
22	BLAKE MS	PREP ROOM	B3	1X4 2L4' T8 32W/NP WRAP	4	2856	60	0.24	685	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	4	2856	28	0.11	320			0.13	366
23	BLAKE MS	RESTROOMS	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	18	2856	60	1.08	3,084	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	18	2856	28	0.50	1439			0.58	1,645
24	BLAKE MS	CUSTODIAN 5	B3	1X4 2L4' T8 32W/NP WRAP	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
25	BLAKE MS	SKYLIGHT CORRIDOR	A1	1X8 2L4' T8 32W/NP PENDANT BOX	4	4836	60	0.24	1,161	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	4	4836	28	0.11	542			0.13	619
26	BLAKE MS	SKYLIGHT CORRIDOR	B6	1X4 1L4' T8 32W/NP PENDANT BOX	4	4836	30	0.12	580	RETROFIT RPT 1L4' 14W T8 LED/BYPASS BALLAST	4	4836	14	0.06	271			0.06	310
27	BLAKE MS	ROOM 215-218	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	78	2856	60	4.68	13,366	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	78	2856	28	2.18	6238			2.50	7,129
28	BLAKE MS	PREP ROOMS	B3	1X4 2L4' T8 32W/NP WRAP	8	2856	60	0.48	1,371	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	8	2856	28	0.22	640			0.26	731
29	BLAKE MS	CORRIDOR	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	6	4836	53	0.32	1,538	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	6	4836	20	0.12	580			0.20	958
30	BLAKE MS	CORRIDOR	D1	2X2 3L4' T8U 31W/NP RECESSED PARABOLIC	1	4836	88	0.09	426	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	1	4836	20	0.02	97			0.07	329
31	BLAKE MS	ROOMS 122-130	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	119	2856	60	7.14	20,392	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	119	2856	28	3.33	9516			3.81	10,876
32	BLAKE MS	CORRIDOR 123-129	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	11	4836	53	0.58	2,819	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	11	4836	20	0.22	1064			0.36	1,755
33	BLAKE MS	RESTROOMS	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	16	2856	60	0.96	2,742	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	16	2856	28	0.45	1279			0.51	1,462
34	BLAKE MS	CORRIDOR	D1	2X2 3L4' T8U 31W/NP RECESSED PARABOLIC	1	4836	88	0.09	426	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	1	4836	20	0.02	97			0.07	329
35	BLAKE MS	CORRIDOR	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	3	4836	53	0.16	769	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	3	4836	20	0.06	290			0.10	479

Prepared: 10/11/2016

RISE ENGINEERING

Blake Middle School
24 Pound Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
36	BLAKE MS	ROOF ACCESS	D1	2X2 3L4' T8U 31W/NP RECESSED PARABOLIC	1	1000	88	0.09	88	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	1	1000	20	0.02	20			0.07	68
37	BLAKE MS	ROOF ACCESS	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	1	1000	88	0.09	88	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	1000	30	0.03	30			0.06	58
38	BLAKE MS	RAMP TO AUDITORIUM	I2	2L18W CFL RECESSED CAN 8"	5	4836	40	0.20	967	NEW SYLVANIA 27W LED 8" REC CAN KIT	5	4836	27	0.14	653			0.07	314
39	BLAKE MS	ROOM 131	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	12	2856	88	1.06	3,016	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	12	1856.4	30	0.22	414	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.83	2,602
40	BLAKE MS	ROOM 131A	B3	1X4 2L4' T8 32W/NP WRAP	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
41	BLAKE MS	CORRIDOR TO CAFÉ	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	7	4836	53	0.37	1,794	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	7	4836	20	0.14	677			0.23	1,117
42	BLAKE MS	CAFETERIA	G1	1X4 3L4' T5HO 54W/PSEB HIF GYM	6	2856	177	1.06	3,033	NEW LUSIO 4MS 88W LED LOWBAY OCC40	6	2856	88	0.53	1508			0.53	1,525
43	BLAKE MS	CAFETERIA	A1	1X8 2L4' T8 32W/NP PENDANT BOX	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
44	BLAKE MS	CAFETERIA	C1	2X4 3L4' T8 16W LED TUBES/NP RECESSED PARABOLIC	4	2856	48	0.19	548	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	2856	30	0.12	343			0.07	206
45	BLAKE MS	TEACHER LUNCH ROOM	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	4	2856	88	0.35	1,005	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	1856.4	30	0.07	138	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.28	867
46	BLAKE MS	RESTROOMS	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	3	2856	60	0.18	514	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	3	2856	28	0.08	240			0.10	274
47	BLAKE MS	FACULTY BATHROOM	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	4	2856	60	0.24	685	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	4	2856	28	0.11	320			0.13	366
48	BLAKE MS	PRINCIPAL/ADMIN OFFICES	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	16	2856	53	0.85	2,422	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	16	1856.4	20	0.20	368	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.65	2,054
49	BLAKE MS	PRINCIPAL/ADMIN OFFICES	I2	2L18W CFL RECESSED CAN 8"	4	2856	40	0.16	457	NEW SYLVANIA 27W LED 8" REC CAN KIT	4	2856	27	0.11	308			0.05	149
50	BLAKE MS	PRINCIPAL/ADMIN OFFICES	B3	1X4 2L4' T8 32W/NP WRAP	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
51	BLAKE MS	GUIDANCE	C1	2X4 3L4' T8 16W LED TUBES/NP RECESSED PARABOLIC	5	2856	48	0.24	685	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	5	1856.4	30	0.09	173	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.15	513
52	BLAKE MS	GUIDANCE	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	6	2856	88	0.53	1,508	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	6	1856.4	30	0.11	207	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.42	1,301
53	BLAKE MS	LIBRARY	I2	2L18W CFL RECESSED CAN 8"	10	2856	40	0.40	1,142	NEW SYLVANIA 27W LED 8" REC CAN KIT	10	2856	27	0.27	771			0.13	371
54	BLAKE MS	LIBRARY OPEN AREA	A2	1X8 2L8' T12 60W/STD OLD WRAP	70	2856	138	9.66	27,589	NEW 1X8 RENOVA NPW8-LO60 44W LED SURFACE WRAP	70	2856	44	3.08	8796			6.58	18,792
55	BLAKE MS	LIBRARY COVE	B6	1X4 1L4' T8 32W/NP PENDANT BOX	24	2856	30	0.72	2,056	RETROFIT RPT 1L4' 14W T8 LED/BYPASS BALLAST	24	2856	14	0.34	960			0.38	1,097
56	BLAKE MS	TUTOR OFFICES	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	4	2856	88	0.35	1,005	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	1856.4	30	0.07	138	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.28	867
57	BLAKE MS	RESTROOMS	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	3	2856	60	0.18	514	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	3	2856	28	0.08	240			0.10	274
58	BLAKE MS	PERIODICAL	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	2	2856	88	0.18	503	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.14	434
59	BLAKE MS	OFFICE	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	1	2856	88	0.09	251	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	1856.4	30	0.02	35	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.07	217
60	BLAKE MS	MAIN FOYER	I2	2L18W CFL RECESSED CAN 8"	4	2856	40	0.16	457	NEW SYLVANIA 27W LED 8" REC CAN KIT	4	2856	27	0.11	308			0.05	149
61	BLAKE MS	SKYLIGHT	D3	1X6 2L3' T8 25W/NP SURFACE BOX	4	2856	47	0.19	537	RETROFIT RPT 2L3' 12W T8 LED/BYPASS BALLAST	4	2856	24	0.10	274			0.09	263
62	BLAKE MS	TEACHERS ROOM	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	3	2856	88	0.26	754	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	3	1856.4	30	0.06	104	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.21	650
63	BLAKE MS	CONFERENCE ROOM 1	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	2	2856	88	0.18	503	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.14	434
64	BLAKE MS	TEACHER WORK ROOM	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	3	2856	88	0.26	754	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	3	1856.4	30	0.06	104	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.21	650
65	BLAKE MS	CORRIDOR	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	3	4836	53	0.16	769	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	3	4836	20	0.06	290			0.10	479
66	BLAKE MS	ROOM 101	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	16	2856	60	0.96	2,742	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	16	2856	28	0.45	1279			0.51	1,462
67	BLAKE MS	NURSE	C1	2X4 3L4' T8 16W LED TUBES/NP RECESSED PARABOLIC	6	2856	48	0.29	823	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	6	1856.4	30	0.11	207	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.18	615
68	BLAKE MS	NURSE	D1	2X2 3L4' T8U 31W/NP RECESSED PARABOLIC	1	2856	88	0.09	251	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	1	2856	20	0.02	57			0.07	194
69	BLAKE MS	NURSE BATHROOM	B1	1X4 2L4' T8 32W/NP INDUSTRIAL	2	2856	60	0.12	343	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	2856	28	0.06	160			0.06	183
70	BLAKE MS	CORRIDOR	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	11	4836	53	0.58	2,819	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	11	4836	20	0.22	1064			0.36	1,755

Prepared: 10/11/2016

RISE ENGINEERING

Blake Middle School
24 Pound Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
71	BLAKE MS	GYM ENTRANCE	I2	2L18W CFL RECESSED CAN 8"	3	4836	40	0.12	580	NEW SYLVANIA 27W LED 8" REC CAN KIT	3	4836	27	0.08	392			0.04	189
72	BLAKE MS	FACULTY BATHROOM	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	8	2856	60	0.48	1,371	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	8	2856	28	0.22	640			0.26	731
73	BLAKE MS	GYM	G2	1X4 4L4' T5HO 54W/PSEB HIF GYM W/ SENSOR	24	4836	234	5.62	27,159	NEW LUSIO 4MS 88W LED LOWBAY OCC40	24	4836	88	2.11	10214			3.50	16,945
74	BLAKE MS	ATHLETICS OFFICE	D1	2X2 3L4' T8U 31W/NP RECESSED PARABOLIC	2	2856	88	0.18	503	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	2	1856.4	20	0.02	46	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.15	457
75	BLAKE MS	ATHLETICS OFFICE	B1	1X4 2L4' T8 32W/NP INDUSTRIAL	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
76	BLAKE MS	GYM OFFICE	B1	1X4 2L4' T8 32W/NP INDUSTRIAL	6	2856	60	0.36	1,028	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	6	2856	28	0.17	480			0.19	548
77	BLAKE MS	ACTIVITY ROOM	B1	1X4 2L4' T8 32W/NP INDUSTRIAL	8	2856	60	0.48	1,371	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	8	2856	28	0.22	640			0.26	731
78	BLAKE MS	HALL TO FITNESS	D1	2X2 3L4' T8U 31W/NP RECESSED PARABOLIC	2	2856	88	0.18	503	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	2	2856	20	0.04	114			0.14	388
79	BLAKE MS	FITNESS ROOM	B1	1X4 2L4' T8 32W/NP INDUSTRIAL	7	2856	60	0.42	1,200	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	7	2856	28	0.20	560			0.22	640
80	BLAKE MS	OFFICE	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	1	2856	88	0.09	251	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	1856.4	30	0.02	35	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.07	217
81	BLAKE MS	TEAM ROOMS 1 & 2	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	8	2856	60	0.48	1,371	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	8	2856	28	0.22	640			0.26	731
82	BLAKE MS	STORAGE ROOMS 4/2	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	4	1000	60	0.24	240	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	4	1000	28	0.11	112			0.13	128
83	BLAKE MS	CORRIDOR	I1	60W INCANDESCENT SCREW IN A LAMP	8	4836	60	0.48	2,321	SCREW-IN GC 9W LED A LAMP	8	4836	9	0.07	348			0.41	1,973
84	BLAKE MS	LOCKER ROOM	B5	1X4 2L4' T8 32W/NP VAPOR TIGHT KITCHEN	22	4836	60	1.32	6,384	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	22	4836	28	0.62	2979			0.70	3,405
85	BLAKE MS	OFFICE	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	1	2856	88	0.09	251	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	2856	30	0.03	86			0.06	166
86	BLAKE MS	BATHROOM	I3	2L13W CFL SURFACE DRUM	8	2856	30	0.24	685	NEW REMPHOS 14W LED DRUM	8	2856	14	0.11	320			0.13	366
87	BLAKE MS	ELECTRIC CLOSET	B1	1X4 2L4' T8 32W/NP INDUSTRIAL	2	1000	60	0.12	120	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	1000	28	0.06	56			0.06	64
88	BLAKE MS	ROOM 105	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	16	2856	60	0.96	2,742	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	16	2856	28	0.45	1279			0.51	1,462
89	BLAKE MS	ROOM 105	I2	2L18W CFL RECESSED CAN 8"	2	2856	40	0.08	228	NEW SYLVANIA 27W LED 8" REC CAN KIT	2	2856	27	0.05	154			0.03	74
90	BLAKE MS	CORRIDOR	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	4	4836	53	0.21	1,025	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	4	4836	20	0.08	387			0.13	638
91	BLAKE MS	ROOM 104	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	8	2856	88	0.70	2,011	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	8	1856.4	30	0.15	276	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.56	1,734
92	BLAKE MS	RAMP TO AUDITORIUM	I2	2L18W CFL RECESSED CAN 8"	7	4836	40	0.28	1,354	NEW SYLVANIA 27W LED 8" REC CAN KIT	7	4836	27	0.19	914			0.09	440
93	BLAKE MS	WRITING CENTER 107	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	12	2856	60	0.72	2,056	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	12	2856	28	0.34	960			0.38	1,097
94	BLAKE MS	LOWER CORRIDOR	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	10	4836	53	0.53	2,563	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	10	4836	20	0.20	967			0.33	1,596
95	BLAKE MS	CORRIDOR	C2	2X4 3L4' T8 32W/NP RECESSED PARABOLIC	1	4836	88	0.09	426	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	4836	30	0.03	145			0.06	280
96	BLAKE MS	RESTROOMS	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	16	2856	60	0.96	2,742	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	16	2856	28	0.45	1279			0.51	1,462
97	BLAKE MS	CUSTODIAN 1	B3	1X4 2L4' T8 32W/NP WRAP	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
98	BLAKE MS	ROOMS 106, 108-113	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	96	2856	60	5.76	16,451	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	96	2856	28	2.69	7677			3.07	8,774
99	BLAKE MS	ROOM 115A	I1	60W INCANDESCENT SCREW IN A LAMP	2	2856	60	0.12	343	SCREW-IN GC 9W LED A LAMP	2	2856	9	0.02	51			0.10	291
100	BLAKE MS	RESTROOMS	B4	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	12	2856	60	0.72	2,056	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	12	2856	28	0.34	960			0.38	1,097
101	BLAKE MS	FOYER	I2	2L18W CFL RECESSED CAN 8"	1	2856	40	0.04	114	NEW SYLVANIA 27W LED 8" REC CAN KIT	1	2856	27	0.03	77			0.01	37
102	BLAKE MS	B124	B1	1X4 2L4' T8 32W/NP INDUSTRIAL	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
103	BLAKE MS	ROOMS 300-307, 327	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	135	2856	60	8.10	23,134	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	135	2856	28	3.78	10796			4.32	12,338
104	BLAKE MS	VESTIBULE/CORRIDOR	I2	2L18W CFL RECESSED CAN 8"	6	4836	40	0.24	1,161	NEW SYLVANIA 27W LED 8" REC CAN KIT	6	4836	27	0.16	783			0.08	377
105	BLAKE MS	CORRIDOR	D4	2X2 2L4' T8U 32W/NP RECESSED PRISMATIC	9	4836	60	0.54	2,611	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	9	4836	20	0.18	870			0.36	1,741

RISE ENGINEERING

Blake Middle School
24 Pound Street
Medfield MA 02052
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ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
106	BLAKE MS	CORRIDOR	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	14	4836	53	0.74	3,588	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	14	4836	20	0.28	1354			0.46	2,234
107	BLAKE MS	ROOMS 114, 116-122, 124	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	136	2856	60	8.16	23,305	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	136	2856	28	3.81	10876			4.35	12,429
108	BLAKE MS	E.L.L.	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	5	2856	60	0.30	857	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	5	2856	28	0.14	400			0.16	457
109	BLAKE MS	DEPT OFFICE	B2	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	5	2856	60	0.30	857	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	5	2856	28	0.14	400			0.16	457
110	BLAKE MS	ROOM 121	D2	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	1	2856	53	0.05	151	NEW ORACLE 2X2 20W LED RECESSED FLAT PANEL	1	1856.4	20	0.01	23	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.04	128
111	BLAKE MS	DRAMA STORAGE	A2	1X8 2L8' T12 60W/STD OLD WRAP	3	1000	138	0.41	414	NEW 1X8 RENOVA NPW8-LO60 44W LED SURFACE WRAP	3	1000	44	0.13	132			0.28	282
112	BLAKE MS	EXTERIOR SMALL FLOODS	F2	250W MH FLOOD JB MOUNT BZ	2	4380	295	0.59	2,584	NEW LITHONIA 41W LED FLOOD JB MOUNT	2	4380	41	0.08	359			0.51	2,225
113	BLAKE MS	EXTERIOR LARGE FLOODS	F1	250W MH FLOOD SLIPFIT BZ	7	4380	295	2.07	9,045	NEW CREE OSQ 71W LED FLOOD DM BZ	7	4380	71	0.50	2177			1.57	6,868
114	BLAKE MS	EXTERIOR WALL SCONCE	WP1	2L32W CFL ROUND WALL SCONCE	10	4380	68	0.68	2,978	NEW REMPHOS 20W LED TOUGH DRUM	10	4380	20	0.20	876			0.48	2,102
115	BLAKE MS	EXTERIOR PARKING LOT POLES	SB1	400W MH SHOEBOX DM RND POLE BZ	35	4380	455	15.93	69,752	NEW CREE OSQ 108W LED SHOEBOX DM BZ	35	4380	109	3.82	16710			12.11	53,042
116	BLAKE MS	EXTERIOR PATHWAY POLES	SB2	250W MH SHOEBOX DM RND POLE BZ	3	4380	295	0.89	3,876	NEW CREE OSQ 71W LED SHOEBOX DM BZ	3	4380	71	0.21	933			0.67	2,943
TOTALS					**1439**			**112.19**	**380,092**		**1439**			**43.79**	**142500**			**68.41**	**237,593**

Prepared: 10/11/2016

TOTALtUBE G2® T8 BALLAST COMPATIBLE & LINE VOLTAGE | PLUG & PLAY

The RemPhos 2nd Generation TOTALtUBE G2® is now the safest, most efficient, and longest warranty LED lamp on the market. Over 140 lumens per watt. Our smart internal driver is compatible with most fluorescent ballasts or remove the ballast all-together and power directly with 120-277V AC line voltage for 7 years of maintenance free operation. Compliant with UL's new for 2016: Type A + Type B LED tube standards. First to market with our patent-pending SMARTSENSE-TLED® intelligent switching system which provides the safest possible installation that prevents any risk of electricity flowing from one end of the tube to the other before all 4 switches are pressed in. The switch also prevents against "socket to lamp pin" electrical arcing. Integrated SMARTSENSE® fused thermal protection to prevent any overheating. Light is emitted >240° through a diffused lens cover to provide both direct and indirect glare-free and completely uniform illumination (you will not see any LED spots). Backed up by RemPhos' extensive and reliable history of manufacturing. Available in 24in, 36in and 48in (normal, medium: MO or high output: HO). Check ballast for dimming compatibility. Non dimmable on line voltage.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

MANUFACTURER	MODEL NUMBER	LAMP STYLE	LENGTH	COLOR TEMPERATURE
RPT	TOTALtUBEG2	T8		
	TOTALtUBEMOG2*		24IN	3000K
	TOTALtUBEHOG2*		36IN	3500K
			48IN	4000K
			24INU	5000K

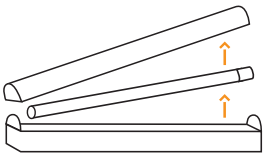
ORDERING EXAMPLE

RPT-TOTALTUBEG2-T8-48IN-4000K * 48IN only

INSTALLATION GUIDE

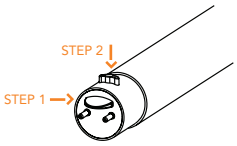
1

Turn off circuit breaker that supplies power to the fixture. Remove lens or diffusion cover on the lighting fixture. Remove existing fluorescent tube. Remove ballast if wiring LED tube to line voltage.



2

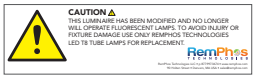
Install TOTALtUBE. If wiring to line voltage, DOUBLE ENDED power is acceptable. Shunted or Non-shunted lamp holders can be utilized.



3

Once LED tube is properly twisted into position, the SMARTSENSE®-TLED switch STEP 1 is complete. Press the SMARTSENSE-TLED® switches labeled STEP 2. Electricity will not flow through lamp until all switches are pressed in.

4



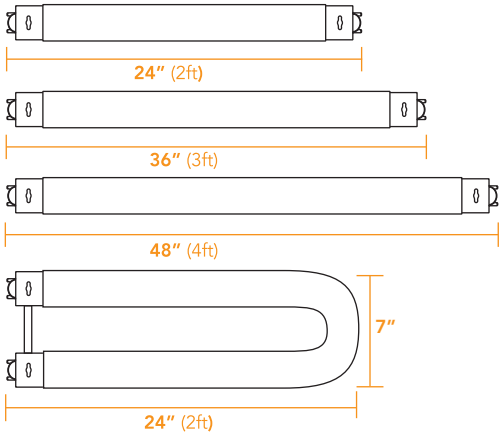
Apply Caution label to a visible spot on the fixture. Replace lens and turn on your lights!

Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC or Fluorescent Ballast
EFFICACY	140 lumens/watt
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	83+
BEAM ANGLE SPREAD	>240° provides direct and indirect
RATED LIFE	L70 LED Lifetime > 80,000 hrs
WARRANTY	7 years/60,000 hrs
CERTIFICATIONS	UL Listed as a Classified Retrofit Kit. Compliant with both Type A + Type B Standards
PERFORMANCE LISTINGS	Select models are DLC. See ordering guide.

DIMENSIONS



TOTALtUBE G2® T8 BALLAST COMPATIBLE & LINE VOLTAGE | PLUG & PLAY

ORDERING GUIDE

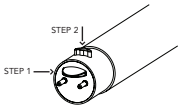
CASE QTY	ENERGY STAR	DLC	PART #	LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
25		●	RPT-TOTALTUBEG2-T8-24IN-XXXXK	1250	9	XXXX	120-277*	7	20W T8 FL	11
25			RPT-TOTALTUBEG2-T8-36IN-XXXXK	1700	12	XXXX	120-277*	7	25W T8 FL	13
25		●	RPT-TOTALTUBEG2-T8-48IN-XXXXK	1700	12	XXXX	120-277*	7	32W T8 FL	20
25		●	RPT-TOTALTUBEMOG2-T8-48IN-XXXXK	1950	14	XXXX	120-277*	7	32W T8 FL	18
25		●	RPT-TOTALTUBEHOG2-T8-48IN-XXXXK	2250	16	XXXX	120-277*	7	32W T8 FL	16
25			RPT-TOTALTUBEG2-T8-24INU-XXXXK	1700	12	XXXX	120-277*	7	40W T8 FL	28

XXXX = 3000, 3500, 4000, or 5000
* 120-277 V AC or Fluorescent ballast

WATTAGE AND LUMEN OUTPUT INFORMATION

PART #	BALLAST TYPE	BALLAST FACTOR	LAMP WATTAGE	SYSTEM WATTAGE*	LAMP LUMENS
RPT-TOTALTUBEG2-T8-24IN	Line Voltage (120-277V AC)	NA	9W	9W	1250LM
	Instant Start	Normal 0.88	9W	12.5W	1250LM
	Instant Start	Low 0.78	7.2W	9.8W	975LM
	Instant Start	High 1.18	12.4W	16.0W	1700LM
RPT-TOTALTUBEG2-T8-36IN	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM
RPT-TOTALTUBEG2-T8-48IN	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM
RPT-TOTALTUBEMOG2-T8-48IN	Line Voltage (120-277V AC)	NA	14W	14W	1950LM
	Instant Start	Normal 0.88	14W	16.9W	1950LM
	Instant Start	Low 0.78	11.2W	13.2W	1520LM
	Instant Start	High 1.18	19.3W	21.7W	2496LM
RPT-TOTALTUBEHOG2-T8-48IN	Line Voltage (120-277V AC)	NA	16W	16W	2250LM
	Instant Start	Normal 0.88	16W	18.4W	2250LM
	Instant Start	Low 0.78	12.8W	14.4W	1750LM
	Instant Start	High 1.18	22.1W	23.6W	2880LM
RPT-TOTALTUBEG2-T8-24INU	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM

* Wattage is calculated by measuring the average system wattage for a single LED tube including ballast. Average system wattage was measured at 120V and 277V with multiple ballasts from Philips, Sylvania, OSRAM, GE, Keystone, Sunpark, Howard. See table with actual test results for more detailed information on performance with specific ballasts.



The SMARTSENSE®-TLED Switch is designed to allow the LED tube to be installed into a fixture wired for double sided line voltage power. The switch ensures that no electricity is able to flow from one end of the tube to the other before all 4 switches are pressed in. Wiring the fixture to double sided line voltage power (opposed to single sided) ensures that if maintenance personnel ever attempts to reinstall a fluorescent lamp into the sockets wired for line voltage, the fluorescent lamp will simply not illuminate. There are no safety concerns.

RemPhos TECHNOLOGIES

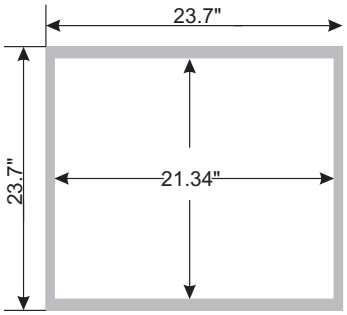
RemPhos Technologies LLC • p 877.997.3674 • www.remphos.com
90 Holten Street • Danvers, MA USA • sales@remphos.com

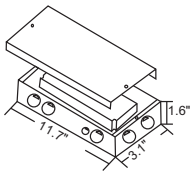
FPL1-LED SERIES

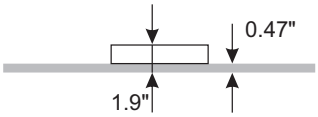
FLAT LED PANEL SERIES

2X2 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER	
PROJECT NAME:	TYPE:







2000 LUMENS	3000 LUMENS	4000 LUMENS	5000 LUMENS
20 WATT	30 WATT	40 WATT	52 WATT

The FPL1-LED flat led panel are DLC Listed,delivers high Lumen of exceptional 80+ CRI light while achieving 106 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature.Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling.This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 22-FPL1-LED-5000L-DIM10-MVOLT-40K

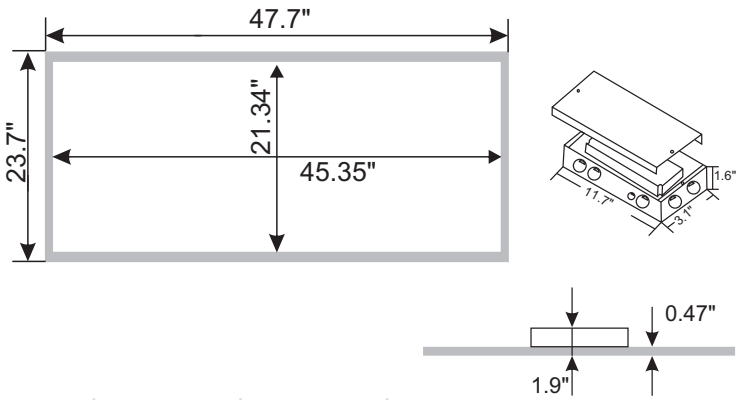
FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
22- 2' X 2'	**FPL1**-Oracle Flat LED Panel	**LED**	**2000L** - (2000 lumens) **3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**22-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

FPL1-LED SERIES

FLAT LED PANEL SERIES

2X4 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER:	
PROJECT NAME:	TYPE:



3000 LUMENS	4000 LUMENS	5000 LUMENS	6000 LUMENS
30 WATT	40 WATT	50 WATT	65 WATT

The FPL1-LED flat led panel are DLC Listed, delivers high Lumen of exceptional 80+ CRI light while achieving 98 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature. Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling. This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

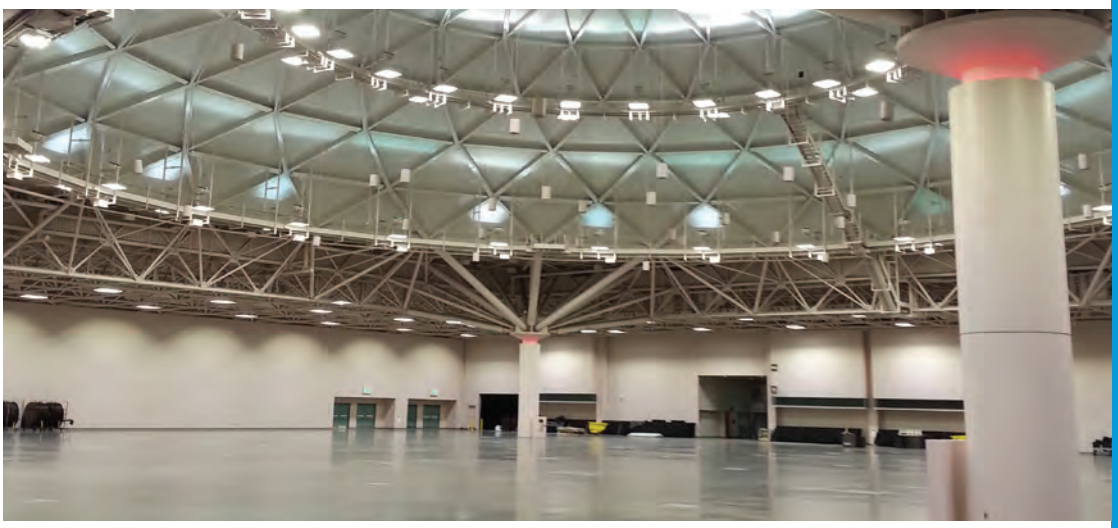
PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 24-FPL1-LED-6000L-DIM10-MVOLT-40K

FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
24 - 2' X 4'	**FPL1**-Oracle Flat LED Panel	**LED**	**3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens) **6000L** - (6000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**24-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

ESSENTIALS SERIES

The award-winning Flex Lighting Solutions Essentials family of LED fixtures provide superior optical performance, quality and versatility for low and high bay applications. With industry-leading fixture efficacy of up to 176 lm/W and up to 80% lower power consumption compared to traditional lighting, Flex Lighting Solutions' Essentials Series LED low-bays and high-bays are designed to provide you with the lowest total cost of ownership (TCO).



- Multiple lumen options (7,000-70,000)
- 4000K or 5000K CCT standard
- Clear and frosted polycarbonate lenses available
- Aisle lighter distribution available
- Supports 120–480V inputs
- Cable, stem or surface mounting options available
- 95% Initial Light Output at 5 Years*
- 85% Initial Light Output at 10 Years*
- Ambient temperature:** -40°C (-40°F) to 55°C (131°F)
- 5-Year standard, up to 10-year optional warranty

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
7000	6862	44	ES3P-2MS	155
	7040	51	ES3V-2MS	137
12000-14000	12119	69	ES3PE-6MS	176
	13201	98	ES3PH-2MS	135
	13521	86	ES3P-4MS	158
	13521	86	ES3P-2M	158
	14039	100	ES3V-4MS	141
	14039	100	ES3V-2M	141
17000-20000	17125	132	ES3VH-4MS	130
	17154	113	ES3PH-4MS	152
	20838	130	ES3P-6MS	161
	20880	146	ES3V-6MS	143

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
24000-28000	25031	190	ES3VU-6MS	132
	25167	184	ES3PK-4MS	137
	25918	170	ES3PU-6MS	152
	27042	171	ES3P-4M	158
	28078	200	ES3V-4M	141
35000-42000	35635	244	ES3PH-6MS	146
	40186	280	ES3PU-4M	143
	41676	259	ES3P-6M	161
	41759	293	ES3V-6M	143
48000-50000	50344	367	ES3VU-6M	137
	51835	341	ES3PU-6M	152
70000	71270	489	ES3PH-6M	146

[1] Typical at 277V (LV) and 77°F (25°C), 5000CCT, Clear Lens, +/-7%. Typical CRI80+. Frosted Lens Multiplier is .94, 4000K Multiplier is .92, Aisle Lens Multiplier is .91.

* Based on 24/7 operation. Standard models (P, V, E). H and U models may have decreased performance.

** MBR fixtures Max Temp 5°C less, typical. Max: 50°C (122°F) for ES3PH-6M, ES3PH-6MS and ES3PH-2MS. EMB fixtures 32°F to 122°F (0°C to 50°C). Temperatures below -20° have limited switch cycles, consult factory.

Ordering Example:

ES3P-A-2MS-50-WIDE-CL-LV-MBR-10V-OCCN-CORDN-EMBN

Series-Compliance-Model

ES3P-A-2MS (6862 lm, 44W)	**ES3V-A-4MS** (14039 lm, 100W)	**ES3VU-A-6MS** (25031 lm, 190W)	**ES3PU-A-4M** (40186 lm, 280W)
ES3V-A-2MS (7040 lm, 51W)	**ES3V-A-2M** (14039 lm, 100W)	**ES3PK-A-4MS** (25167 lm, 184W)	**ES3P-A-6M** (41676 lm, 259W)
ES3PE-A-6MS (12119 lm, 69W)	**ES3VH-A-4MS** (17125 lm, 132W)	**ES3PU-A-6MS** (25918 lm, 170W)	**ES3V-A-6M** (41759 lm, 293W)
ES3PH-A-2MS (13201 lm, 98W)	**ES3PH-A-4MS** (17154 lm, 113W)	**ES3P-A-4M** (27042 lm, 171W)	**ES3VU-A-6M** (50344 lm, 367W)
ES3P-A-4MS (13521 lm, 86W)	**ES3P-A-6MS** (20838 lm, 130W)	**ES3V-A-4M** (28078 lm, 200W)	**ES3PU-A-6M** (51835 lm, 341W)
ES3P-A-2M (13521 lm, 86W)	**ES3V-A-6MS** (20880 lm, 146W)	**ES3PH-A-6MS** (35635 lm, 244W)	**ES3PH-A-6M** (71270 lm, 489W)

Color Temp[1]

40
4000K

50
5000K

Other CCT Available upon request

Distribution

Wide
Wide Distribution

Aisle[10]
Aisle Distribution

Lens

CL
Clear Lens

FR
Frosted Lens

Voltage

LV
120-227V

HV
347-480V

Mounting

CRM[6]
Cable Ready (Standard) and has center opening to accept 3/4" stem

MBR[1]
Includes fixture mounting box and bracket for surface mount applications Adds 1.125" to fixture height

HOOK[1]
Field installed mounting kit, includes hook and one pair of levleing cables for hook/loop applications

MBRWT
Includes field installed MBR with factory installed balancing weight

HKWT[1]
Mounting kit including field installed hook and factory installed balancing weight

Dimming

10V
0–10V Interface (standard)

OCC Sensors

OCCN
No Sensor (standard)

OCC8[1]
Occ Sensor, on/off 8' Mounting Height

OCC20[1, 2]
Occ Sensor, on/off 20' Mounting Height

OCC40[1, 2]
Occ Sensor, on/off 40' Mounting Height

OCCDIM8[1, 4, 5]
Occ Sensor, dimmable 8' Mounting Height

OCCDIM20[1, 4, 5]
Occ Sensor, dimmable 20' Mounting Height

OCCDIM40[1, 4, 5]
Occ Sensor, dimmable 40' Mounting Height

DAINT[1, 3, 4,9]
Kit includes Daintree Wireless Fixture

DAINTR[1, 3, 4, 9]
Fixture is Factory Wired for easy integration of Daintree Wireless Controls

Cord & Plug

CORDN
No cord/plug (standard)

C6W[1, 8]
6ft cord, 15A, no plug

C15W[1,8]
15ft cord, 15A, no plug

C515[1, 8]
6ft cord, 15A, straight plug 120V (5-15P)

CL515[1,8]
6ft cord, 15A, locking plug 120V (L5-15P)

CL715[1, 8]
6ft cord, 15A, locking plug 277V (L7-15P)

CL720[1, 8]
6ft cord, 20A, locking plug 277V (L7-20P)

CL2420[1, 8]
6ft cord, 20A, locking plug 347V (L24-20P)

CL820[1,8]
6ft cord, 20A, locking plug 480V (L8-20P)

Battery Backup

EMBN
No emergency battery back-up available (standard)

EMBR[1, 4, 7, 9]
Fixture is EMB-Ready, with test button, indicator lamp and wiring harness factory installed

Option

OPTN
No Option

QDC
Driver Quick Disconnect

PROLV
Fixture installed Surge Protector 120-277V

PROHV
Fixture installed Surge Protector 347-480V

QDLV
Quick Disconnect with LV Surge Protector

QDHV
Quick Disconnect with HV Surge Protector

When submitting for utility incentives and rebates, please use part numbers. Please see our DLC Cross Reference Part Number Guide for mating the Catalog Ordering Code to the corresponding part number at www.flexlightingsolutions.com/pdf/DLC/ES3-DLC-CrossRef.pdf

[1] Optional add-on. See price list for pricing.

[2] Optional add-on for 120-277V only. High voltage options available as special order with longer lead time. Contact factory for pricing and lead time.

[3] Daintree options do not include Daintree ControlScope SoftwareTM, wireless connection hardware/infrastructures, or field commissioning. Consult Daintree for more information and ordering assistance.

[4] Optional add-on available in 120-277V only.

[5] Wireless programmer required for final field setup. See ACCESSORIES.

[6] Optional CABLEKIT ordered separately. See ACCESSORIES.

[7] Field installed EMB KIT must be ordered with this option. See ACCESSORIES.

[8] All cords are 16/3 AWG, 600V, and white.

[9] Consult factory for orders requiring DAINTR and EMBR.

[10] Aisle Lens option available in Clear only

ULTRA RT6 HO LED

Recessed Downlight Kit

RT6 HO RT5/6

SYLVANIA ULTRA RT6 HO is a universal input voltage 5" and 6" compatible LED recessed downlight kit that creates high performing white light and is optimized for new construction and retrofit applications utilizing pin based compact fluorescent lamps. Installation is done quickly and easily in most standard six-inch frames.

The RT6 HO downlight is offered in 900 lumen and 1500 lumen options and achieves up to 71 lumens per watt.

The RT6 HO is designed to deliver light output comparable to traditional 1x18W, 1x26W and 2x26W pin based compact fluorescent luminaires.

Key Features & Benefits

- 120-277 universal input voltage
- Lumen package:
  - 900 lumens @ 13 watts (0-10V Dimmable)
  - 1500 lumens @ 21 watts (Not dimmable)
- Replacement for 18W, 26W and 32W CFL pin based lamps
- Fits in standard 5" and 6" CFL mounting frame
- CCT: 2700K, 3000K, 3500K & 4000K
- CRI of >80
- 50,000 hour life (L_{70})
- Suitable for dry, damp and wet locations
- UL1598 Listed and Classified for stand-alone and retrofit applications
- Reduces energy consumption up to 34%
- Lasts up to 4 times longer than compact fluorescent lamps
- No warm-up time, instant-on with full light output and stable lamp to lamp color
- Integrated white trim and metal conduit adaptor (included) for direct replacement

Product Offering

Ordering Abbreviation	Wattage	CCT
LED/RT5/6/HO/900	13	2700K, 3000K, 3500K, 4000K
LED/RT6/HO/1500	21	3000K, 3500K, 4000K

Application Information

Application Notes

1. Operating temperature range between -4°F and +104°F (-20°C and +40°C).
2. Suitable for use in indoor dry, damp and wet location commercial application environments.
3. Compatible with Philips Bodine ELI-S-20 Emergency Lighting Micro Inverter.
4. Designed to install in standard 6" CFL mounting frame. For a list of compatible housings, please refer to www.sylvania.com/RT6.
5. For detailed warranty information, please see www.sylvania.com/RT6.
6. RT6/HO 1500 lumen is not intended for use in dimming applications.
7. The RT5/6 HO 900 lumen is compatible with Leviton 0-10V dimmer model IP710-DL.
8. For installation in non-insulated ceilings: If insulation is present, it may be placed around the retrofit kit as long as a three-inch space is maintained around the kit.
9. Installation performed as a stand-alone kit (without frame) is recommended for hard ceiling. Installation of a recessed incandescent frame (such as Lightolier model 1102P1) is recommended for tiled ceiling application for proper support of the retrofit kit.

Specifications and Certifications

Specification Data

Catalog #	Type
Project	
Comments	
Prepared by	

Specifications

Energy Data

Minimum Starting Temp: -20°C (-4°F)

EMI/RFI: RT6/HO 1500 lumen: FCC Title 47 CFR, Part 15, Class B
RT6/HO 900 lumen: FCC Title 47 CFR, Part 15, Class A

Sound Rating: <24dBA

Input Voltage: 120-277V

Power Factor: >0.90

Input Frequency: 60Hz

THD: <20%

Input Power: 13W & 21W

Input Current: 0.15A @ 120V; 0.07A @ 277V

Maximum Ambient Operating Temperature (Non-Insulated Ceiling): 40°C (104°F)

Lighting Data

Lumen Output: 900 and 1500

Lumens per Watt: 71

Color

Correlated Color Temperature (CCT): 2700K, 3000K, 3500K, 4000K

Color Rendering Index (CRI): >80

Product weight: 1.6lb

Ordering Information

Item Number	Ordering Abbreviation	Recessed Housing	Replaced CFL Wattage	Nominal Wattage (W)	Delivered Light Output (lm)	Color Temperature	Avg. Rated Life (hrs)*	Packaging Configuration	Dimmable
75137	RT5/6/HO/900/827	5" and 6"	18W	13	900	2700K	50,000	4/case	YES
75138	RT5/6/HO/900/830	5" and 6"	18W	13	900	3000K	50,000	4/case	YES
75140	RT5/6/HO/900/835	5" and 6"	18W	13	900	3500K	50,000	4/case	YES
75139	RT5/6/HO/900/840	5" and 6"	18W	13	900	4000K	50,000	4/case	YES
72487	LED/RT6/1500/HO/830	6"	26W & 32W	21	1500	3000K	50,000	4/case	NO
72494	LED/RT6/1500/HO/835	6"	26W & 32W	21	1500	3500K	50,000	4/case	NO
72495	LED/RT6/1500/HO/840	6"	26W & 32W	21	1500	4000K	50,000	4/case	NO

* LED lamp life is defined as the number of hours when 50% of an average group of identical lamps reached 70% of its initial lumens.

Ordering Guide

LED	/	RT6	/	1500	/	HO	/	8	30
LED		Product Name RT6 5/6 = fits 5" and 6" frames 6 = fits 6" frames		Light Output 1500lm 900lm		High Outout		CRI >80	Color Temperature 2700K, 3000K, 3500K, 4000K

Energy Savings

Basic Product Description	LED Lumens	LED Life	Traditional Lamp Types	Lumens	Life	Watts Saved With RT6	RT6 Energy Savings*	RT6 Life Benefit
RT5/6 HO 13W	900	50,000	18W CFL DD, DT	1200	16,000	5	$27	3X
RT6/HO 21W	1500	50,000	26W CFL DD, DT	1800	16,000	5	$27	3X
RT6/HO 21W	1500	50,000	32W CFL DD, DT	2400	16,000	11	$60	3X

* Based on $0.11/kWh over 50,000 hours life.

Accessories

RT5/6 Retrofit Trim

75095	RT/5/6/TRIM/DKBZ
75097	RT/5/6/TRIM/BLK
75098	RT/5/6/TRIM/ORBZ

75097 75098

TOUGHDRUM®

DURABLE AND BEAUTIFUL LED FIXTURE | POWERED BY OUR LEDCR®

Don't let its good looks fool you. Same rugged quality as the outdoor drum, with beautiful black anodized trim. The fixture is designed to safely and quickly replace any existing incandescent or fluorescent fixture. Includes all of the mounting hardware and electrical connections required. Optional integrated occupancy sensor dims fixture to low energy mode when space is unoccupied.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

MANUFACTURER	MODEL NUMBER	SIZE	LUMENS	COLOR TEMP	OPTIONS
RPT	TOUGHDRUM	13IN			
			1600LM	3000K*	OCC HI/LO VARIABLE OCCUPANCY SENSOR
			2200LM	4000K	10VDIM 0-10V DIMMABLE
					EMG EMERGENCY BATTERY BACKUP
					120 LVD TRIAC/PHASE DIMMABLE
					277 LVD TRIAC/PHASE DIMMABLE

ORDERING EXAMPLE

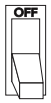
RPT-TOUGHDRUM-13IN-1600LM-3000K-OCC

* 3000K part number can be used for 3000-3500K

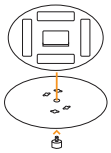
LEDCR LIGHT ENGINE

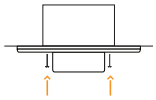
The ToughDrum is powered by our patented, infield replacable and upgradable light engine. See LEDCR cut sheet for more information.

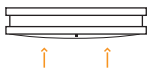
INSTALLATION GUIDE

1. 

Turn off power to the fixture.

2. 
Make connections & using provided brass nut, tighten LEDCR plate onto fixture.

3. 
Install LEDCR/fixture base assembly to existing junction box using longer provided screws.

4. 
Install fixture lens, turn on power.

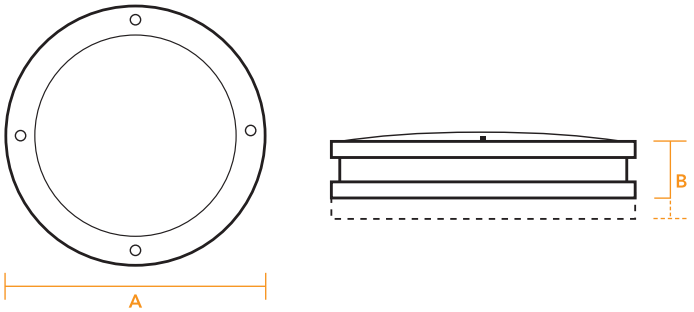
Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC
EFFICACY	>120 LPW @ 4000K
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	85+
WARRANTY	5 years
CERTIFICATIONS	
PERFORMANCE LISTINGS	

May be protected under the following US patents
US 8,106569 | US 8,882,298 | Additional patents pending.

DIMENSIONS



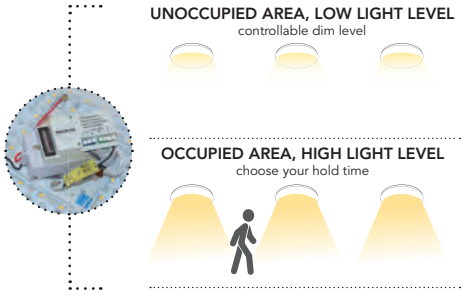
DIMENSIONS (INCHES)	A	B
RPT-TOUGHDRUM-13IN (without optional EMG)	13	3.75
RPT-TOUGHDRUM-13IN (with optional EMG)	13	5.25

TOUGHDRUM® DURABLE AND BEAUTIFUL LED FIXTURE | POWERED BY OUR LEDCR®

ORDERING GUIDE

QUICK SHIP	DLC E*	PART #	LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
	E*	RPT-TOUGHDRUM-13IN-1600LM-3000K	1350	12	3000	120-277	5	3 x 13W CFL (45W)	33
	E*	RPT-TOUGHDRUM-13IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
	DLC E*	RPT-TOUGHDRUM-13IN-1600LM-3000K-OCC	1350	14hi/3lo	3000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
	DLC E*	RPT-TOUGHDRUM-13IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
	E*	RPT-TOUGHDRUM-13IN-2200LM-3000K	1900	18	3000	120-277	5	2 x 26W CFL (54W)	36
	E*	RPT-TOUGHDRUM-13IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
	DLC E*	RPT-TOUGHDRUM-13IN-2200LM-3000K-OCC	1900	20hi/4lo	3000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
	DLC E*	RPT-TOUGHDRUM-13IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo

OPTIONAL FACTORY INSTALLED OCC SENSOR



The LEDCR can be paired with our integral occupancy sensor for maximum energy savings. Unlike traditional passive infrared or ultrasonic occupancy sensors, this high-frequency sensor can be hidden behind the lens of an existing fixture, eliminating the need for external sensors and providing a clean look.

OPTIONAL FACTORY INSTALLED EMG BACKUP

The LEDCR can be paired with an Emergency battery backup. Provides over 90 minutes of safe light levels when power goes out. Battery backup is installed in fixture housing without the need for increasing fixture height.

OPTIONAL TRIM COLORS AND COLLAR

The ToughDrum® housing metal trim can be custom powder coated to virtually color. Also stand-off collar can be provided for mounting of fixture to hard surfaces. Contact us for details.

RemPhos TECHNOLOGIES

RemPhos Technologies LLC • p 877.997.3674 • www.remphos.com
90 Holten Street • Danvers, MA USA • sales@remphos.com

OSQ Series

OSQ™ LED Area/Flood Luminaire – Medium

Product Description

The OSQ™ Area/Flood luminaire blends extreme optical control, advanced thermal management and modern, clean aesthetics. Built to last, the housing is rugged cast aluminum with an integral, weathertight LED driver compartment. Versatile mounting configurations offer simple installation. Its slim, low-profile design minimizes wind load requirements and blends seamlessly into the site providing even, quality illumination. 'A' and 'B' Input power designators are a suitable upgrade for HID applications up to 250 Watt. 'J' and 'K' Input power designators are a suitable upgrade for HID applications up to 400 Watt.

Applications: Parking lots, walkways, campuses, car dealerships, office complexes, and internal roadways

Performance Summary

NanoOptic® Precision Delivery Grid™ optic

Made in the U.S.A. of U.S. and imported parts

Initial Delivered Lumens: Up to 17,191

Efficacy: Up to 136 LPW

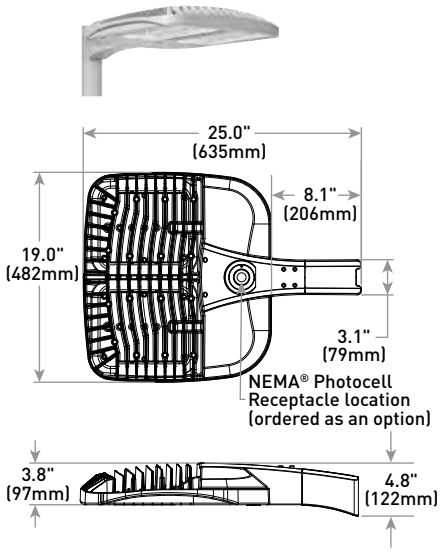
CRI: Minimum 70 CRI (4000K & 5700K; 3000K asymmetric optics); 80 CRI (3000K symmetric optics)

CCT: 3000K (+/- 300K), 4000K (+/- 300K), 5700K (+/- 500K)

Limited Warranty†: 10 years on luminaire/10 years on Colorfast DeltaGuard® finish

† See http://lighting.cree.com/warranty for warranty terms

DA Mount



Weight
26.5 lbs. (12kg)

Accessories

Field-Installed	
Backlight Shield OSQ-BLSMF – Front facing optics OSQ-BLSMR – Rotated optics	**Hand-Held Remote** XA-SENSREM - For successful implementation of the programmable multi-level option, a minimum of one hand-held remote is required

Ordering Information

Fully assembled luminaire is composed of two components that must be ordered separately:
Example: **Mount:** OSQ-AASV + **Luminaire:** OSQ-A-NM-2ME-A-40K-UL-SV

Mount (Luminaire must be ordered separately)			
OSQ-			
OSQ-AA Adjustable Arm **OSQ-DA** Direct Arm	**Color Options:**	**SV** Silver **BK** Black	**BZ** Bronze **WH** White

Luminaire (Mount must be ordered separately)

OSQ	A	NM						
Product	**Version**	**Mounting**	**Optic**	**Input Power Designator**	**CCT**	**Voltage**	**Color Options**	**Options**
OSQ	A	**NM** No Mount	**Asymmetric** **2ME*** Type II Medium **4ME*** Type IV Medium **3ME*** Type III Medium **Symmetric** **5ME** Type V Medium **5SH** Type V Short **WSN** Wide Sign **15D** 15° Flood **25D** 25° Flood **40D** 40° Flood **60D** 60° Flood	**A** 112W **J** 168W **B** 86W **K** 130W	**30K** 3000K **40K** 4000K **57K** 5700K	**UL** Universal 120-277V **UH** Universal 347-480V	**BK** Black **BZ** Bronze **SV** Silver **WH** White	**DIM** 0-10V Dimming - Control by others - Refer to Dimming spec sheet for details - Can't exceed wattage of specified input power designator **F** Fuse - When code dictates fusing, use time delay fuse **ML** Multi-Level - Refer to ML spec sheet for details - High: 100%, Low: 30% - Available with UL voltage only - Intended for downlight applications at 0° tilt **PML** Programmable Multi-Level, 20-40' Mounting Height - Refer to PML spec sheet for details - Available with UL voltage only - Intended for downlight applications at 0° tilt **PML2** Programmable Multi-Level, 10-30' Mounting Height - Refer to PML spec sheet for details - Available with UL voltage only - Intended for downlight applications at 0° tilt **Q9** Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details **R** NEMA® Photocell Receptacle - Intended for downlight applications with maximum 45° tilt - 3-pin receptacle per ANSI C136.10 - Photocell and shorting cap by others **RL** Rotate Left - LED and optic are rotated to the left **RR** Rotate Right - LED and optic are rotated to the right

* Available with Backlight Shield when ordered with field-installed accessory (see table above)

Rev. Date: V8 05/23/2016

US: lighting.cree.com/lighting T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Product Specifications

CONSTRUCTION & MATERIALS

- Slim, low profile design minimizes wind load requirements
- Luminaire housing is rugged die cast aluminum with an integral, weathertight LED driver compartment and high performance heat sink
- Convenient interlocking mounting method on direct arm mount. Mounting adaptor is rugged die cast aluminum and mounts to 3-6" (76-152mm) square or round pole, secured by two 5/16-18 UNC bolts spaced on 2" (51mm) centers
- Mounting for the adjustable arm mount adaptor is rugged die cast aluminum and mounts to 2" (51mm) IP, 2.375" (60mm) O.D. tenon
- Adjustable arm mount can be adjusted 180˚ in 2.5˚ increments
- Designed for uplight and downlight applications
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Silver, bronze, black, and white are available
- **Weight:** 26.5 lbs. (12kg)

ELECTRICAL SYSTEM

- **Input Voltage:** 120-277V or 347-480V, 50/60Hz, Class 1 drivers
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used
- **10V Source Current:** 0.15mA

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- Suitable for wet locations
- Enclosure rated IP66 per IEC 60529 when ordered without R option
- Consult factory for CE Certified products
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets FCC Part 15 , Subpart B, Class A standards for conducted and radiated emissions
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA
- DLC qualified when ordered with asymmetric optics with 40K or 57K. Please refer to www.designlights.org/QPL for most current information
- RoHS compliant. Consult factory for additional details

Electrical Data*

Input Power Designator	Optic	System Watts 120-480V	Total Current					
			120V	208V	240V	277V	347V	480V
A	Asymmetric	112	0.97	0.56	0.49	0.43	0.34	0.25
J		168	1.47	0.85	0.74	0.64	0.50	0.36
B	Symmetric	86	0.73	0.43	0.37	0.32	0.25	0.19
K		130	1.09	0.65	0.56	0.49	0.38	0.28

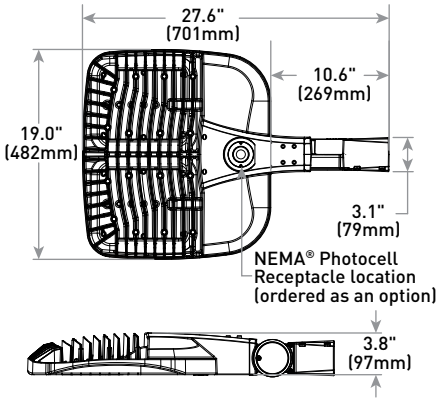
* Electrical data at 25˚C (77˚F). Actual wattage may differ by +/- 10% when operating between 120-480V +/-10%

Recommended OSQ Series Lumen Maintenance Factors (LMF)[1]

Ambient	Optic	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Projected[2] LMF	100K hr Calculated[3] LMF
5˚C (41˚F)	Asymmetric	1.04	0.99	0.93	0.89	0.84
	Symmetric	1.05	1.00	0.96[3]	0.92[3]	0.88[3]
10˚C (50˚F)	Asymmetric	1.03	0.98	0.93	0.88	0.83
	Symmetric	1.04	0.99	0.95[3]	0.91[3]	0.87[3]
15˚C (59˚F)	Asymmetric	1.02	0.97	0.92	0.87	0.82
	Symmetric	1.02	0.98	0.94[3]	0.90[3]	0.87[3]
20˚C (68˚F)	Asymmetric	1.01	0.96	0.91	0.86	0.82
	Symmetric	1.01	0.96	0.92[3]	0.88[3]	0.85[3]
25˚C (77˚F)	Asymmetric	1.00	0.95	0.90	0.85	0.81
	Symmetric	1.00	0.95	0.91[3]	0.88[3]	0.84[3]

[1] Lumen maintenance values at 25˚C (77˚F) are calculated per TM-21 based on LM-80 data and in-situ luminaire testing
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT] i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT] i.e. the packaged LED chip)

AA Mount



Weight
26.5 lbs. (12kg)

RENOVA
Innovative Lighting Ideas
Energy Efficient Solutions

Category: LED

Narrow Profile Wrap

Prefix: NPW

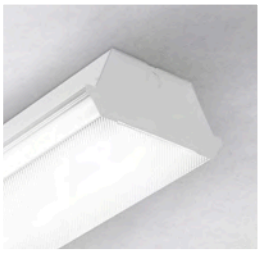
The Narrow Profile Wrap (NPW) Fixture family has been developed to dramatically improve energy efficiency and quality of light using Solid State Lighting (SSL) technologies. The Narrow Profile Wrap Series provides an attractive, low profile, energy efficient architectural look which has been specifically designed to replace existing fluorescent lighting or for use in new construction. Comfortable, low glare, uniform lighting is attributed to this style of fixture. Typical applications for this type of product are interior spaces where finished ceilings and walls exist. Applications include:

- *Commercial/Corporate Office Spaces*
- *Retail Spaces, Public Spaces and Airports*
- *Schools, Colleges and Universities*
- *Hospitals, Government Facilities and Military Bases*

VETERAN OWNED AND OPERATED · RoHS COMPLIANT · made in USA · c UL us LISTED · Illuminating Engineering Society Sustaining Member

Narrow Profile Wrap
(Shown with Optional Frosted Lens)

Clear, Prismatic
Lens Shown
(Standard)



project:

fixture type:

catalog #:

quantity:

ORDERING GUIDE

NPW - ____ - ____ - ____ - ____ - ____ - ____ - ____ - ____ - ____

PREFIX/ SERIES	SIZE	OPTICS (DISTRIBUTION)	LUMEN OUTPUT*	DRIVER VOLTAGE	DRIVER TYPE	COLOR TEMP.	LENS (DIFFUSER)	HOUSING COLOR / FINISH	FIXTURE OPTIONS
NPW - Narrow Profile Wrap Fixture	**1** - 1' **2** - 2' **3** - 3' **4** - 4' **6** - 6' **8** - 8'	**N** - Normal **C** - Custom (Specify)	**L010** **L130** **L020** **L140** **L030** **L150** **L040** **L160** **L050** **L170** **L060** **L180** **L070** **L190** **L080** **L200** **L090** **L210** **L100** **L220** **L110** **L230** **L120** **L240** **LC** - Custom (Specify)	**UNV** - Universal Voltage (120v - 277v) (60 Hz) (Standard) **120** - 120v, 60Hz **277** - 277v, 60Hz **347** - 347v *Special Order Only	**DM** - 0-10v Low Voltage Dimming (10% - 100%) (Standard) **SD** - Step Dimming (50% / 100%) **LV** - Line Voltage Dimming *Specify Voltage (120v or 277v)	**C27** - 2700 K* **C30** - 3000 K* **C35** - 3500 K **C40** - 4000 K **C50** - 5000 K* *Special Order Only	**AP** - Clear, Linear Prismatic Acrylic Lens (Standard) **AF** - Frosted Linear Prism Acrylic Lens (Optional) **CS** - Custom (Specify)	**PP** - Prepainted (White) (Standard With Pop Rivet Construction) **GW** - Gloss White (Smooth) **TW** - Textured White **TB** - Textured Black **CS** - Custom Finish (Specify)	**OS** - Occupancy Sensor **DL** - Daylight Havesting Sensor **OD** - Occupancy/ Daylight Sensor **OS** - OSRAM Wireless Sensor **EN** - "Encelium" Wireless Sensor **DS** - Digital Sensor **DT** - "DainTree" Wireless Sensor **EM** - Emergency Battery Pack *

*L(x) = Delivered Lumens
Example: L090 = 9,000 Lumens

24'–0"

8' HSG	6' HSG	4' HSG	3' HSG	2' HSG	1' HSG

*EXAMPLE: CONTINUOUS ROW @ 1000 LUMENS PER FOOT

(QTY=1) NPW8-N-L080-UNV-DM-C40-AF-PP
(QTY=1) NPW4-N-L040-UNV-DM-C40-AF-PP
(QTY=1) NPW2-N-L020-UNV-DM-C40-AF-PP
(QTY=1) NPW6-N-L060-UNV-DM-C40-AF-PP
(QTY=1) NPW3-N-L030-UNV-DM-C40-AF-PP
(QTY=1) NPW1-N-L010-UNV-DM-C40-AF-PP

RENOVA Products Listed on the DLC Qualified Product List (QPL)

See page 4 for complete list.

* Standard "EM" option to be NiCd Battery @ 1000 Lumens @ 90 min. duration (standard). Consult factory for all available options.

** NPW Series Fixtures have a lumen output range from 300 Lumens through 24,000 Lumens depending on length of fixture and driver/board configuration. Consult factory for correct catalog number on all custom configured lighting products.

PRIOR TO REPLACING AN EXISTING FLUORESCENT FIXTURE, PLEASE NOTE THE FOLLOWING:

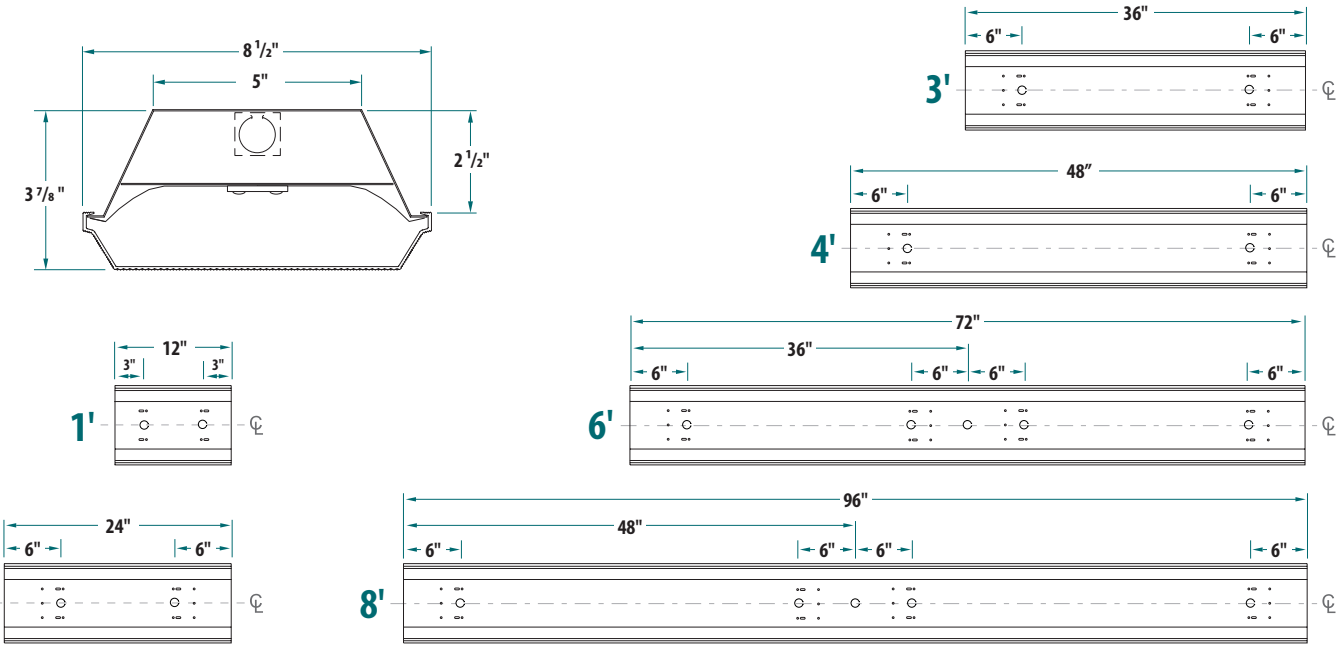
Fluorescent lamps contain small amounts of mercury. Such lamps are labeled "Contains Mercury" and / or with the symbol "Hg." Lamps that contain mercury must be disposed of in accordance with local requirements. Information regarding lamp recycling and disposal can be found at www.lamprecycle.org.

DLC Application Category #7
"Linear Ambient Lighting
of Interior Commercial Spaces"

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified

NPW Cross Section & Fixture Dimensions

Prefix: NPW



Note: Unless otherwise specified, all EKOs are 7/8" diameter.

CONSTRUCTION

- Precision die-formed from code-gauge cold rolled steel.
- Mechanically fastened (standard – when ordered as "PP" under "Housing Color / Finish" in the ordering guide.
- Resistance (spot) welded construction is optional.
- Consult factory for all options or any modifications needed.

FINISH

- Housing
  - High Reflectance Gloss White polyester powder coat baked enamel. "PP" indicates White pre-paint (pop-riveted) construction. "GW" indicates Gloss White post paint (spot-welded) construction.
- Reflector/Optics
  - High Reflectance White polyester powder coat baked enamel for extreme durability and superior optical efficiency.

LED's/OPTICS

- High performance LED boards manufactured specifically for interior lighting. LED boards feature the latest mid-power LEDs for maximum performance, efficiency and longevity.
- Standard color temperatures offered are 3500K and 4000K. Consult factory for all other color temperature options. 80 CRI (Minimum). RoHS Compliant.
- Always consult factory for the latest developments and improvements concerning LEDs and Optics.

DRIVERS

- Electronic, high efficiency, programmable, linear, constant current type. Universal voltage 120v–277v (Standard)
- Features include constant lumen maintenance, end of life indication and LED thermal protection.
- 0-10v dimmable. 10%–100% dimming (Standard) / 1%–100% dimming (Optional).
- Factory programmed drive current, Dim to Off function, Soft Start function.
- Step-Dim and Line Voltage Dimming Drivers are optional.
- Auxiliary output (Optional) used to power various sensors / wireless modules.
- Suitable for dry and damp locations.
- UL/CUL Class 2 Recognized, RoHS Compliant.

LENS (DIFFUSER)

- Extruded, clear, 100% virgin acrylic, linear ribbed with pattern 12 prismatic embossment (Standard).
- 30% DR additive used to increase resistance to breakage (Optional).
- Optional frosted lens / diffuser manufactured from extruded, 100% virgin acrylic & high light transmission / LED diffusing polymer featuring linear ribbed pattern, which provides a clean, aesthetic architectural look.

MOUNTING

- Fixtures are designed to be surface mounted, or suspended using pendant, aircraft cable, or jack chain. Consult factory for all other special mounting conditions.

ELECTRICAL

- Surface Mount Fixtures are UL/CUL listed and labeled for dry/damp locations.
- LM80 performance for 50,000+ hours
- Bi-Level dimming option allows 50% power for compliance with common energy codes.
- Driver disconnect provided where required to comply with US & Canadian codes.

QUALITY CONTROL

- All fixtures are designed, fabricated, assembled, tested, packaged and shipped from RENOVA's manufacturing facility in Mansfield, MA (USA).

WARRANTY

- 5-year limited warranty. Please refer to RENOVA's website at www.renova.com/sales/warranties for the latest warranty terms and conditions.

NOTES:

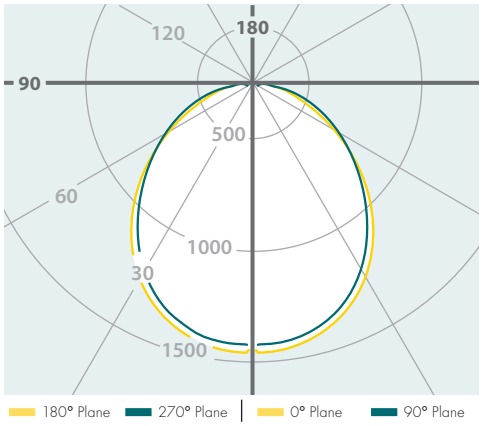
LED Dimming Drivers have adjustable output capability. A wide range of input watts/lumen output can be adjusted up or down on all models to suit a particular application. Always consult factory for the latest information.

Photometric data, IES files and all other information is available on request.

RENOVA products are constantly being improved; therefore the information shown is subject to change without notice. Always consult your lighting representative or RENOVA Lighting Systems, Inc. for the latest information.

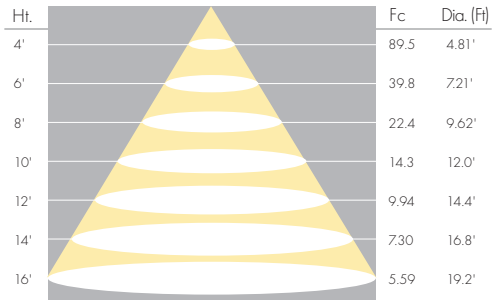
Catalog #: NPW4-N-L037-UNV-DM-C40-AF-XX-XX
Photometric Test Report #: 11201679-1231475
Delivered Lumens: 3738
Efficacy (Lumens/Watt): 137.8
Power: 27.13w @ 120 VAC
Power Factor: 0.996
Current THD: 5.72%
CRI: 83.7
CCT: 3988 K
LED Life: 50,000+ hrs

Candela Distribution Polar Plot



Spacing/Mounting Height: 1.22
SC (Along): 1.22 SC (Across): 1.22

Cone of Light Tabulation



Utilization of Lumens - Zonal Cavity Method

Effective Floor Cavity Reflectance 20%

Ceiling Cavity Reflectance	80				70				50		
Wall Reflectance	70	50	30	10	70	50	30	10	50	30	10
Room Cavity Ratio (RCR)	** Values are expressed as Lumens delivered to the task surface **										
0	4428	4428	4428	4428	4315	4315	4315	4315	4103	4103	4103
1	4042	3863	3703	3558	3931	3769	3624	3491	3594	3474	3365
2	3687	3382	3130	2918	3580	3304	3073	2876	3157	2963	2796
3	3371	2984	2684	2445	3271	2918	2641	2417	2794	2558	2363
4	3095	2655	2333	2087	3003	2600	2300	2068	2495	2235	2030
5	2853	2382	2052	1809	2769	2335	2026	1795	2246	1975	1767
6	2640	2151	1823	1588	2563	2111	1802	1577	2035	1761	1556
7	2452	1956	1635	1409	2383	1922	1617	1401	1857	1584	1385
8	2286	1789	1477	1262	2223	1760	1463	1256	1703	1435	1243
9	2138	1646	1344	1140	2081	1620	1332	1135	1571	1308	1124
10	2007	1521	1230	1037	1955	1499	1220	1032	1456	1200	1024

Average Luminance (cd/m²)

Horizontal Angle (Degrees)

Angle	Along	45.0	Across
0	5604	5604	5604
45	4542	3953	3797
55	3869	3309	3257
65	3143	2711	2822
75	2349	2165	2446
85	1335	1608	2052

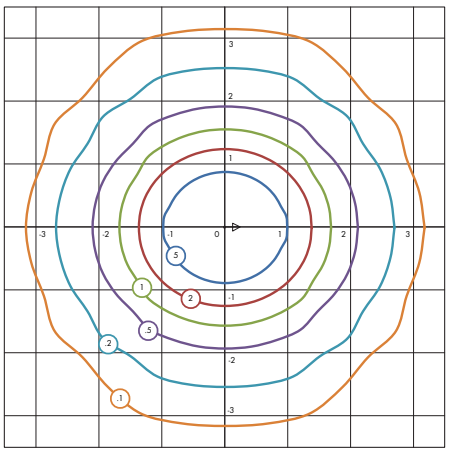
Zonal Lumen Summary

Zone	Lumens	% Luminaire
0-30	1093	29.2%
0-40	1752	46.9%
0-60	2918	78.1%
0-90	3648	97.6%
40-90	1896	50.8%
60-90	730	19.5%
90-180	90	2.4%
0-180	3738	100.0%

Luminaire Efficacy (Lumens Per Watt): 139.1

Horizontal Footcandles

Mounting Height = 8'-0' A.F.F.
Maximum Calculated Value = 18.43 Fc



Grid Lines in Units of Mounting Height

5 fc | 2 fc | 1 fc | .5 fc | .2 fc | .1 fc

NPW Fixtures Listed on the DLC Qualified Products List (QPL)

RENOVA Catalog Number	Delivered Lumens	Input Watts	Lumens per Watt	DLC – QPL Classification
NPW2-N-L015-UNV-DM-C35-AP-xx-xx	1469	11.62	126.41	Premium
NPW2-N-L015-UNV-DM-C35-AF-xx-xx	1464	11.47	127.63	Premium
NPW2-N-L015-UNV-DM-C40-AP-xx-xx	1488	11.77	126.42	Premium
NPW2-N-L015-UNV-DM-C40-AF-xx-xx	1483	11.77	125.99	Premium

RENOVA Catalog Number	Delivered Lumens	Input Watts	Lumens per Watt	DLC – QPL Classification
NPW4-N-L015-UNV-DM-C35-AP-xx-xx	1505	12.02	125.24	Premium
NPW4-N-L015-UNV-DM-C35-AF-xx-xx	1523	12.02	126.81	Premium
NPW4-N-L015-UNV-DM-C40-AP-xx-xx	1544	12.02	128.53	Premium
NPW4-N-L015-UNV-DM-C40-AF-xx-xx	1562	12.02	130.03	Premium
NPW4-N-L020-UNV-DM-C35-AP-xx-xx	2067	15.35	134.71	Premium
NPW4-N-L020-UNV-DM-C35-AF-xx-xx	2092	15.35	136.29	Premium
NPW4-N-L020-UNV-DM-C40-AP-xx-xx	2122	15.35	138.25	Premium
NPW4-N-L020-UNV-DM-C40-AF-xx-xx	2146	15.35	139.86	Premium
NPW4-N-L030-UNV-DM-C35-AP-xx-xx	3048	22.17	137.50	Premium
NPW4-N-L030-UNV-DM-C35-AF-xx-xx	3084	22.17	139.11	Premium
NPW4-N-L030-UNV-DM-C40-AP-xx-xx	3128	22.17	141.11	Premium
NPW4-N-L030-UNV-DM-C40-AF-xx-xx	3164	22.17	142.76	Premium
NPW4-N-L040-UNV-DM-C35-AP-xx-xx	3971	29.52	134.54	Premium
NPW4-N-L040-UNV-DM-C35-AF-xx-xx	4018	29.52	136.11	Premium
NPW4-N-L040-UNV-DM-C40-AP-xx-xx	4075	29.52	138.07	Premium
NPW4-N-L040-UNV-DM-C40-AF-xx-xx	4123	29.52	139.68	Premium

RENOVA Catalog Number	Delivered Lumens	Input Watts	Lumens per Watt	DLC – QPL Classification
NPW8-N-L030-UNV-DM-C35-AP-xx-xx	3235	21.98	147.19	Premium
NPW8-N-L030-UNV-DM-C35-AF-xx-xx	3273	21.98	148.91	Premium
NPW8-N-L030-UNV-DM-C40-AP-xx-xx	3320	21.98	151.05	Premium
NPW8-N-L030-UNV-DM-C40-AF-xx-xx	3358	21.98	152.82	Premium
NPW8-N-L040-UNV-DM-C35-AP-xx-xx	4235	29.03	145.90	Premium
NPW8-N-L040-UNV-DM-C35-AF-xx-xx	4285	29.03	147.61	Premium
NPW8-N-L040-UNV-DM-C40-AP-xx-xx	4346	29.03	149.73	Premium
NPW8-N-L040-UNV-DM-C40-AF-xx-xx	4397	29.03	151.48	Premium
NPW8-N-L060-UNV-DM-C35-AP-xx-xx	6195	43.66	141.91	Premium
NPW8-N-L060-UNV-DM-C35-AF-xx-xx	6268	43.66	143.56	Premium
NPW8-N-L060-UNV-DM-C40-AP-xx-xx	6358	43.66	145.63	Premium
NPW8-N-L060-UNV-DM-C40-AF-xx-xx	6432	43.66	147.33	Premium
NPW8-N-L080-UNV-DM-C35-AP-xx-xx	8029	59.00	136.09	Premium
NPW8-N-L080-UNV-DM-C35-AF-xx-xx	8123	59.00	137.68	Premium
NPW8-N-L080-UNV-DM-C40-AP-xx-xx	8239	59.00	139.66	Premium
NPW8-N-L080-UNV-DM-C40-AF-xx-xx	8336	59.00	141.29	Premium

UTILITY DRUM CIRCULAR LED CEILING FIXTURE | POWERED BY OUR LEDCR®

Perfect for hallways, stairwells and entry ways. The fixture is designed to safely and quickly replace any existing incandescent or fluorescent fixture. Includes all of the mounting hardware and electrical connections required. Optional integrated occupancy sensor dims fixture to low energy mode when space is unoccupied.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

MANUFACTURER	MODEL NUMBER	SIZE	LUMENS	COLOR TEMP	OPTIONS
RPT	DRUM				
		11IN	900LM	3000K*	**OCC** HI/LO VARIABLE OCCUPANCY SENSOR
		14IN	1600LM	4000K	**10VDIM** 0-10V DIMMABLE
			2200LM		**EMG** EMERGENCY BATTERY BACKUP
			3000LM		**120 LVD** TRIAC/PHASE DIMMABLE
					277 LVD TRIAC/PHASE DIMMABLE

ORDERING EXAMPLE

RPT-DRUM-11IN-900LM-3000K-OCC

* 3000K part number can be used for 3000-3500K

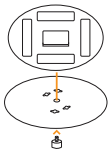
LEDCR LIGHT ENGINE

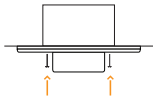
The Designer Drum is powered by our patented, infield replacable and upgradable light engine. See LEDCR cut sheet for more information.

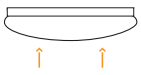
INSTALLATION GUIDE

1. 

Turn off power to the fixture.

2. 
Make connections & using provided brass nut, tighten LEDCR plate onto fixture.

3. 
Install LEDCR/fixture base assembly to existing junction box using longer provided screws.

4. 
Install fixture lens, turn on power.

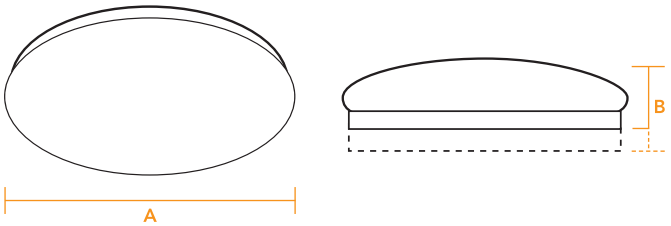
Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC
EFFICACY	>120 LPW @ 4000K
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	85+
WARRANTY	5 years
CERTIFICATIONS	
PERFORMANCE LISTINGS	

May be protected under the following US patents
US 8,106569 | US 8,882,298 | Additional patents pending.

DIMENSIONS



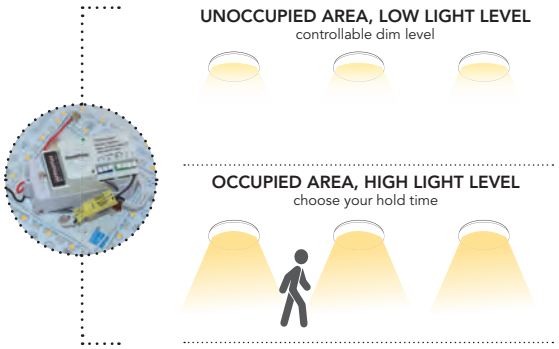
DIMENSIONS (INCHES)	A	B
RPT-DRUM-11IN (without optional EMG)	11	3.5
RPT-DRUM-11IN (with optional EMG)	11	5
RPT-DRUM-14IN (without optional EMG)	14	3.5
RPT-DRUM-14IN (with optional EMG)	14	5

UTILITY DRUM CIRCULAR LED CEILING FIXTURE | POWERED BY OUR LEDCR®

ORDERING GUIDE

QUICK SHIP	DLC E*	PART #	FIXTURE LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
X	E*	RPT-DRUM-11IN-900LM-3000K	710	7	3000-3500	120-277	5	2 x CFL (30W)	23
	E*	RPT-DRUM-11IN-900LM-4000K	760	7	4000	120-277	5	2 x 13W CFL (30W)	23
X	E*	RPT-DRUM-11IN-1600LM-3000K	1250	12	3000-3500	120-277	5	3 x 13W CFL (45W)	33
X	DLC/E*	RPT-DRUM-11IN-1600LM-3000K-OCC	1250	14hi/3lo	3000-3500	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-11IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
X	DLC/E*	RPT-DRUM-11IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-11IN-2200LM-3000K	1800	18	3000-3500	120-277	5	2 x 26W CFL (54W)	36
X	DLC/E*	RPT-DRUM-11IN-2200LM-3000K-OCC	1800	20hi/4lo	3000-3500	120-277	5	2 x 26W CFL (54W)	34hi/50lo
X	E*	RPT-DRUM-11IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
X	DLC/E*	RPT-DRUM-11IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
X	E*	RPT-DRUM-14IN-1600LM-3000K	1250	12	3000-3500	120-277	5	3 x 13W CFL (45W)	33
X	DLC/E*	RPT-DRUM-14IN-1600LM-3000K-OCC	1250	14hi/3lo	3000-3500	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-14IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
X	DLC E*	RPT-DRUM-14IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-14IN-2200LM-3000K	1800	18	3000-3500	120-277	5	2 x 26W CFL (54W)	36
X	DLC E*	RPT-DRUM-14IN-2200LM-3000K-OCC	1800	20hi/4lo	3000-3500	120-277	5	2 x 26W CFL (54W)	34hi/50lo
X	E*	RPT-DRUM-14IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
X	E*	RPT-DRUM-14IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
	E*	RPT-DRUM-14IN-3000LM-3000K	2400	27	3000-3500	120-277	5	3 x 26W CFL (80W)	53
	E*	RPT-DRUM-14IN-3000LM-4000K	2500	27	4000	120-277	5	3 x 26W CFL (80W)	53

OPTIONAL FACTORY INSTALLED OCC SENSOR



The LEDCR can be paired with our integral occupancy sensor for maximum energy savings. Unlike traditional passive infrared or ultrasonic occupancy sensors, this high-frequency sensor can be hidden behind the lens of an existing fixture, eliminating the need for external sensors and providing a clean look.

OPTIONAL FACTORY INSTALLED EMG BACKUP

The LEDCR can be paired with an Emergency battery backup. Provides over 90 minutes of safe light levels when power goes out.

RemPhos TECHNOLOGIES

RemPhos Technologies LLC • p 877.997.3674 • www.remphos.com
90 Holten Street • Danvers, MA USA • sales@remphos.com

Appendix A3

RISE ENGINEERING™
Division of Thielsch Engineering, Inc
1341 Elmwood Avenue
Cranston, Rhode Island 02910

EVERSOURCE

Dale Street School LED Lighting Upgrades

NEW LED CLASSROOM WRAP FIXTURES & LED RECESSED FLAT PANELS

Financial Summary

Total Project Cost	**$**	**118,289**
Estimated Electric Incentive	**$**	**(19,575)**
Customer Net Cost	**$**	**98,714**
Estimated Energy Cost Savings Annually	**$**	**12,919**
Estimated Maintenance Savings	**$**	**2,016**
Return on Investment (ROI)		**15%**
Simple Payback in Years		**6.6**

Energy Savings

kW Reduction	kWh Reduction
22.16	**78,299**

Pollution Savings

CO2 Reduction (lbs)	NOx Reduction (lbs)	SO2 Reduction (lbs)
99,205	**84.0**	**310.5**

Prepared: 10/11/2016

RISE ENGINEERING

Dale Street School
45 Adams Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
1	DALE STREET	2ND FLR CORRIDOR	B1	1X4 2L4' T8 32W/NP OLD WRAP	8	4836	60	0.48	2,321	NEW 1X4 RENOVA 30W LED WRAP	8	4836	30	0.24	1161			0.24	1,161
2	DALE STREET	CLASSROOMS 15, 21	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	12	2856	112	1.34	3,838	NEW 1X8 RENOVA 59W LED WRAP	12	2856	59	0.71	2022			0.64	1,816
3	DALE STREET	CLASSROOMS 15, 21	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	4	2856	60	0.24	685	NEW 1X4 RENOVA 30W LED WRAP	4	2856	30	0.12	343			0.12	343
4	DALE STREET	CLASSROOMS 17, 19-20	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	18	2856	112	2.02	5,758	NEW 1X8 RENOVA 59W LED WRAP	18	2856	59	1.06	3033			0.95	2,725
5	DALE STREET	RESTROOMS	D1	2X2 2L4' T8U 32W/NP RECESSED PRISMATIC	7	2856	60	0.42	1,200	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	7	2856	30	0.21	600			0.21	600
6	DALE STREET	CUSTODIAN	I1	58W FLUORESCENT OLD CIRCLINE DRUM	1	4836	58	0.06	280	NEW REMPHOS 14W LED DRUM	1	4836	14	0.01	68			0.04	213
7	DALE STREET	STORAGE	B1	1X4 2L4' T8 32W/NP OLD WRAP	1	1000	60	0.06	60	NEW 1X4 RENOVA 30W LED WRAP	1	1000	30	0.03	30			0.03	30
8	DALE STREET	CLASSROOM16, 18	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	14	2856	112	1.57	4,478	NEW 1X8 RENOVA 59W LED WRAP	14	2856	59	0.83	2359			0.74	2,119
9	DALE STREET	CLASSROOM16, 18	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	4	2856	60	0.24	685	NEW 1X4 RENOVA 30W LED WRAP	4	2856	30	0.12	343			0.12	343
10	DALE STREET	STAIRWELL	B1	1X4 2L4' T8 32W/NP OLD WRAP	6	8760	60	0.36	3,154	NEW 1X4 RENOVA 30W LED WRAP	6	8760	30	0.18	1577			0.18	1,577
11	DALE STREET	1ST FLOOR CORRIDOR	B1	1X4 2L4' T8 32W/NP OLD WRAP	5	4836	60	0.30	1,451	NEW 1X4 RENOVA 30W LED WRAP	5	4836	30	0.15	725			0.15	725
12	DALE STREET	CLASSROOM 204	C1	2X4 4L4' T8 32W/NP RECESSED PRISMATIC	12	2856	112	1.34	3,838	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	12	1856.4	30	0.22	414	LRF2-OKLB-P-WH	RMJ-5T-DV-B	1.12	3,424
13	DALE STREET	CLASSROOMS 206-207	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	5	2856	112	0.56	1,599	NEW 1X8 RENOVA 59W LED WRAP	5	2856	59	0.30	843			0.27	757
14	DALE STREET	CLASSROOMS 206-207	I1	58W FLUORESCENT OLD CIRCLINE DRUM	1	2856	58	0.06	166	NEW REMPHOS 14W LED DRUM	1	2856	14	0.01	40			0.04	126
15	DALE STREET	CLASSROOMS 205	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	6	2856	112	0.67	1,919	NEW 1X8 RENOVA 59W LED WRAP	6	2856	59	0.35	1011			0.32	908
16	DALE STREET	CLASSROOMS 205	I2	90W INCANDESCENT TRACK PAR38	4	2856	90	0.36	1,028	SI GREEN CREATIVE 14W LED BR40	4	2856	14	0.06	160			0.30	868
17	DALE STREET	CLASSROOM 203	C1	2X4 4L4' T8 32W/NP RECESSED PRISMATIC	10	2856	112	1.12	3,199	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	10	1856.4	30	0.19	345	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.93	2,853
18	DALE STREET	CLASSROOMS 202/11	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	12	2856	112	1.34	3,838	NEW 1X8 RENOVA 59W LED WRAP	12	2856	59	0.71	2022			0.64	1,816
19	DALE STREET	ROOM 13	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	8	2856	112	0.90	2,559	NEW 1X8 RENOVA 59W LED WRAP	8	2856	59	0.47	1348			0.42	1,211
20	DALE STREET	JANITORS CLOSET	I1	58W FLUORESCENT OLD CIRCLINE DRUM	1	1000	58	0.06	58	NEW REMPHOS 14W LED DRUM	1	1000	14	0.01	14			0.04	44
21	DALE STREET	CORRIDOR	B1	1X4 2L4' T8 32W/NP OLD WRAP	5	4836	60	0.30	1,451	NEW 1X4 RENOVA 30W LED WRAP	5	4836	30	0.15	725			0.15	725
22	DALE STREET	BAND STORAGE	B1	1X4 2L4' T8 32W/NP OLD WRAP	2	1000	60	0.12	120	NEW 1X4 RENOVA 30W LED WRAP	2	1000	30	0.06	60			0.06	60
23	DALE STREET	MUSIC/ART	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	10	2856	112	1.12	3,199	NEW 1X8 RENOVA 59W LED WRAP	10	2856	59	0.59	1685			0.53	1,514
24	DALE STREET	CORRIDOR	B1	1X4 2L4' T8 32W/NP OLD WRAP	6	4836	60	0.36	1,741	NEW 1X4 RENOVA 30W LED WRAP	6	4836	30	0.18	870			0.18	870
25	DALE STREET	CLASSROOM 209	C1	2X4 4L4' T8 32W/NP RECESSED PRISMATIC	2	2856	112	0.22	640	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.19	571
26	DALE STREET	BOYS RESTROOM	B1	1X4 2L4' T8 32W/NP OLD WRAP	2	2856	60	0.12	343	NEW 1X4 RENOVA 30W LED WRAP	2	2856	30	0.06	171			0.06	171
27	DALE STREET	LOBBY	B1	1X4 2L4' T8 32W/NP OLD WRAP	3	4836	60	0.18	870	NEW 1X4 RENOVA 30W LED WRAP	3	4836	30	0.09	435			0.09	435
28	DALE STREET	GYM	G1	1X4 6L4' T5HO 54W/PSEB HIF	9	4836	325	2.93	14,145	NEW LUSIO 6MS 130W LED LOWBAY	9	4836	130	1.17	5658			1.76	8,487
29	DALE STREET	STAIRS TO GYM	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	14	8760	112	1.57	13,736	NEW 1X8 RENOVA 59W LED WRAP	14	8760	59	0.83	7236			0.74	6,500
30	DALE STREET	CHOIR ROOM	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	2	2856	112	0.22	640	NEW 1X8 RENOVA 59W LED WRAP	2	2856	59	0.12	337			0.11	303
31	DALE STREET	CHOIR ROOM	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	1	2856	60	0.06	171	NEW 1X4 RENOVA 30W LED WRAP	1	2856	30	0.03	86			0.03	86
32	DALE STREET	SHORT HALLWAY	B1	1X4 2L4' T8 32W/NP OLD WRAP	1	4836	60	0.06	290	NEW 1X4 RENOVA 30W LED WRAP	1	4836	30	0.03	145			0.03	145
33	DALE STREET	STORAGE ROOMS	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	9	1000	60	0.54	540	NEW 1X4 RENOVA 30W LED WRAP	9	1000	30	0.27	270			0.27	270
34	DALE STREET	MAIN ENTRANCE & CORRIDOR	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	8	4836	60	0.48	2,321	NEW 1X4 RENOVA 30W LED WRAP	8	4836	30	0.24	1161			0.24	1,161

RISE ENGINEERING

Dale Street School
45 Adams Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
35	DALE STREET	MAIN OFFICE	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	15	2856	60	0.90	2,570	NEW 1X4 RENOVA 30W LED WRAP	15	2856	30	0.45	1285			0.45	1,285
36	DALE STREET	MAIN OFFICE	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	3	2856	60	0.18	514	NEW 1X4 RENOVA 30W LED WRAP	3	2856	30	0.09	257			0.09	257
37	DALE STREET	ROOM 10	B3	1X4 2L4' T8 28W/LP RECESSED PARACUBE	9	2856	60	0.54	1,542	NEW 1X4 RENOVA 24W WIDE BASE WRAP/2-14W LED TUBES	9	2856	24	0.22	617			0.32	925
38	DALE STREET	BATHROOMS	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	4	2856	60	0.24	685	NEW 1X4 RENOVA 30W LED WRAP	4	2856	30	0.12	343			0.12	343
39	DALE STREET	CAFETERIA	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	20	4836	112	2.24	10,833	NEW 1X8 RENOVA 59W LED WRAP	20	4836	59	1.18	5706			1.06	5,126
40	DALE STREET	CAFETERIA	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	4	4836	60	0.24	1,161	NEW 1X4 RENOVA 30W LED WRAP	4	4836	30	0.12	580			0.12	580
41	DALE STREET	TEACHER ROOM 4	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	1	2856	60	0.06	171	NEW 1X4 RENOVA 30W LED WRAP	1	2856	30	0.03	86			0.03	86
42	DALE STREET	CLASSROOMS 1-3, 5-9	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	48	2856	112	5.38	15,354	NEW 1X8 RENOVA 59W LED WRAP	48	2856	59	2.83	8088			2.54	7,266
43	DALE STREET	CLASSROOMS 1-3, 5-9	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	24	2856	60	1.44	4,113	NEW 1X4 RENOVA 30W LED WRAP	24	2856	30	0.72	2056			0.72	2,056
44	DALE STREET	KITCHEN	B3	1X4 2L4' T8 28W/LP RECESSED PARACUBE	21	2856	60	1.26	3,599	NEW 1X4 RENOVA 24W WIDE BASE WRAP/2-14W LED TUBES	21	2856	24	0.50	1439			0.76	2,159
45	DALE STREET	STORAGE	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	2	1000	60	0.12	120	NEW 1X4 RENOVA 30W LED WRAP	2	1000	30	0.06	60			0.06	60
46	DALE STREET	DRY STORAGE	I1	58W FLUORESCENT OLD CIRCLINE DRUM	1	1000	58	0.06	58	NEW REMPHOS 14W LED DRUM	1	1000	14	0.01	14			0.04	44
47	DALE STREET	TO LIBRARY	B3	1X4 2L4' T8 28W/LP RECESSED PARACUBE	8	4836	60	0.48	2,321	NEW 1X4 RENOVA 24W WIDE BASE WRAP/2-14W LED TUBES	8	4836	24	0.19	929			0.29	1,393
48	DALE STREET	STORAGE/SERVER ROOM	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	2	1000	60	0.12	120	NEW 1X4 RENOVA 30W LED WRAP	2	1000	30	0.06	60			0.06	60
49	DALE STREET	CUSTODIAN	I1	58W FLUORESCENT OLD CIRCLINE DRUM	1	4836	58	0.06	280	NEW REMPHOS 14W LED DRUM	1	4836	14	0.01	68			0.04	213
50	DALE STREET	RESTROOMS	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	2	4836	112	0.22	1,083	NEW 1X8 RENOVA 59W LED WRAP	2	4836	59	0.12	571			0.11	513
51	DALE STREET	LIBRARY	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	14	2856	112	1.57	4,478	NEW 1X8 RENOVA 59W LED WRAP	14	2856	59	0.83	2359			0.74	2,119
52	DALE STREET	LIBRARY	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	3	2856	60	0.18	514	NEW 1X4 RENOVA 30W LED WRAP	3	2856	30	0.09	257			0.09	257
53	DALE STREET	CORRIDOR	C2	2X4 3L4' T8 28W/LP RECESSED PRISMATIC	6	4836	63	0.38	1,828	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	6	4836	30	0.18	870			0.20	958
54	DALE STREET	CLASSROOMS P1-P2	C2	2X4 3L4' T8 28W/LP RECESSED PRISMATIC	24	2856	63	1.51	4,318	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	24	1856.4	30	0.45	829	LRF2-OKLB-P-WH	RMJ-5T-DV-B	1.07	3,490
55	DALE STREET	RESTROOMS	C2	2X4 3L4' T8 28W/LP RECESSED PRISMATIC	4	2856	63	0.25	720	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	2856	30	0.12	343			0.13	377
56	DALE STREET	OFFICE	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	1	2856	112	0.11	320	NEW 1X8 RENOVA 59W LED WRAP	1	2856	59	0.06	169			0.05	151
57	DALE STREET	OFFICE	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	2	2856	60	0.12	343	NEW 1X4 RENOVA 30W LED WRAP	2	2856	30	0.06	171			0.06	171
58	DALE STREET	MAINTENANCE	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	1	4836	112	0.11	542	NEW 1X8 RENOVA 59W LED WRAP	1	4836	59	0.06	285			0.05	256
59	DALE STREET	BASEMENT	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	4	1000	112	0.45	448	NEW 1X8 RENOVA 59W LED WRAP	4	1000	59	0.24	236			0.21	212
60	DALE STREET	BOILER	B2	1X4 2L4' T8 32W/NP RENOVA WRAP	4	2856	60	0.24	685	NEW 1X4 RENOVA 30W LED WRAP	4	2856	30	0.12	343			0.12	343
61	DALE STREET	BOILER	A1	1X8 4L4' T8 32W/NP RENOVA WRAP	4	2856	112	0.45	1,279	NEW 1X8 RENOVA 59W LED WRAP	4	2856	59	0.24	674			0.21	605
62	DALE STREET	EXTERIOR GYM ENTRANCE	I3	200W INCANDESCENT MOGUL BASE EXTERIOR CANOPY	3	4380	200	0.60	2,628	SI GREEN CREATIVE 45W LED HID MOGUL BASE	3	4380	45	0.14	591			0.47	2,037
TOTALS					**448**			**41.29**	**144,951**		**448**			**19.12**	**66652**			**22.16**	**78,299**

Prepared: 10/11/2016

RENOVA
Innovative Lighting Ideas
Energy Efficient Solutions

Category: LED

Narrow Profile Wrap

Prefix: NPW

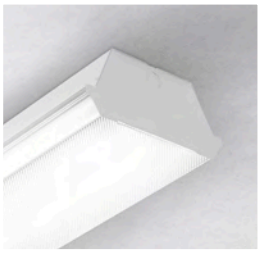
The Narrow Profile Wrap (NPW) Fixture family has been developed to dramatically improve energy efficiency and quality of light using Solid State Lighting (SSL) technologies. The Narrow Profile Wrap Series provides an attractive, low profile, energy efficient architectural look which has been specifically designed to replace existing fluorescent lighting or for use in new construction. Comfortable, low glare, uniform lighting is attributed to this style of fixture. Typical applications for this type of product are interior spaces where finished ceilings and walls exist. Applications include:

- *Commercial/Corporate Office Spaces*
- *Retail Spaces, Public Spaces and Airports*
- *Schools, Colleges and Universities*
- *Hospitals, Government Facilities and Military Bases*

VETERAN OWNED AND OPERATED · RoHS COMPLIANT · made in USA · c UL us LISTED · Illuminating Engineering Society Sustaining Member

Narrow Profile Wrap
(Shown with Optional Frosted Lens)

Clear, Prismatic
Lens Shown
(Standard)



project:

fixture type:

catalog #:

quantity:

ORDERING GUIDE

NPW - ____ - ____ - ____ - ____ - ____ - ____ - ____ - ____ - ____

PREFIX/ SERIES	SIZE	OPTICS (DISTRIBUTION)	LUMEN OUTPUT*	DRIVER VOLTAGE	DRIVER TYPE	COLOR TEMP.	LENS (DIFFUSER)	HOUSING COLOR / FINISH	FIXTURE OPTIONS
NPW - Narrow Profile Wrap Fixture	**1** - 1' **2** - 2' **3** - 3' **4** - 4' **6** - 6' **8** - 8'	**N** - Normal **C** - Custom (Specify)	**L010** **L130** **L020** **L140** **L030** **L150** **L040** **L160** **L050** **L170** **L060** **L180** **L070** **L190** **L080** **L200** **L090** **L210** **L100** **L220** **L110** **L230** **L120** **L240** **LC** - Custom (Specify)	**UNV** - Universal Voltage (120v - 277v) (60 Hz) (Standard) **120** - 120v, 60Hz **277** - 277v, 60Hz **347** - 347v *Special Order Only	**DM** - 0-10v Low Voltage Dimming (10% - 100%) (Standard) **SD** - Step Dimming (50% / 100%) **LV** - Line Voltage Dimming *Specify Voltage (120v or 277v)	**C27** - 2700 K* **C30** - 3000 K* **C35** - 3500 K **C40** - 4000 K **C50** - 5000 K* *Special Order Only	**AP** - Clear, Linear Prismatic Acrylic Lens (Standard) **AF** - Frosted Linear Prism Acrylic Lens (Optional) **CS** - Custom (Specify)	**PP** - Prepainted (White) (Standard With Pop Rivet Construction) **GW** - Gloss White (Smooth) **TW** - Textured White **TB** - Textured Black **CS** - Custom Finish (Specify)	**OS** - Occupancy Sensor **DL** - Daylight Havesting Sensor **OD** - Occupancy/ Daylight Sensor **OS** - OSRAM Wireless Sensor **EN** - "Encelium" Wireless Sensor **DS** - Digital Sensor **DT** - "DainTree" Wireless Sensor **EM** - Emergency Battery Pack *

*L(x) = Delivered Lumens
Example: L090 = 9,000 Lumens

24'–0"

8' HSG	6' HSG	4' HSG	3' HSG	2' HSG	1' HSG

*EXAMPLE: CONTINUOUS ROW @ 1000 LUMENS PER FOOT

(QTY=1) NPW8-N-L080-UNV-DM-C40-AF-PP
(QTY=1) NPW4-N-L040-UNV-DM-C40-AF-PP
(QTY=1) NPW2-N-L020-UNV-DM-C40-AF-PP
(QTY=1) NPW6-N-L060-UNV-DM-C40-AF-PP
(QTY=1) NPW3-N-L030-UNV-DM-C40-AF-PP
(QTY=1) NPW1-N-L010-UNV-DM-C40-AF-PP

RENOVA Products Listed on the DLC Qualified Product List (QPL)

See page 4 for complete list.

* Standard "EM" option to be NiCd Battery @ 1000 Lumens @ 90 min. duration (standard). Consult factory for all available options.

** NPW Series Fixtures have a lumen output range from 300 Lumens through 24,000 Lumens depending on length of fixture and driver/board configuration. Consult factory for correct catalog number on all custom configured lighting products.

PRIOR TO REPLACING AN EXISTING FLUORESCENT FIXTURE, PLEASE NOTE THE FOLLOWING:

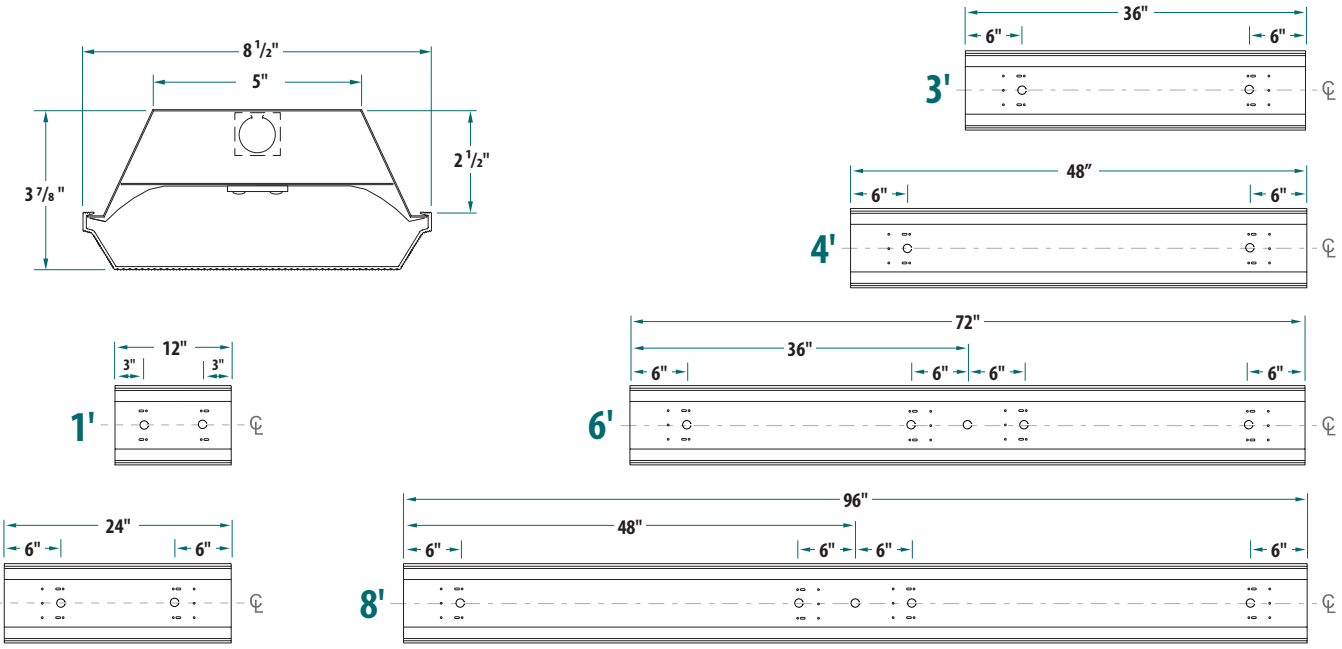
Fluorescent lamps contain small amounts of mercury. Such lamps are labeled "Contains Mercury" and / or with the symbol "Hg." Lamps that contain mercury must be disposed of in accordance with local requirements. Information regarding lamp recycling and disposal can be found at www.lamprecycle.org.

DLC Application Category #7
"Linear Ambient Lighting
of Interior Commercial Spaces"

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified

NPW Cross Section & Fixture Dimensions

Prefix: NPW



Note: Unless otherwise specified, all EKOs are 7/8" diameter.

CONSTRUCTION

- Precision die-formed from code-gauge cold rolled steel.
- Mechanically fastened (standard – when ordered as "PP" under "Housing Color / Finish" in the ordering guide.
- Resistance (spot) welded construction is optional.
- Consult factory for all options or any modifications needed.

FINISH

- Housing
  - High Reflectance Gloss White polyester powder coat baked enamel. "PP" indicates White pre-paint (pop-riveted) construction. "GW" indicates Gloss White post paint (spot-welded) construction.
- Reflector/Optics
  - High Reflectance White polyester powder coat baked enamel for extreme durability and superior optical efficiency.

LED's/OPTICS

- High performance LED boards manufactured specifically for interior lighting. LED boards feature the latest mid-power LEDs for maximum performance, efficiency and longevity.
- Standard color temperatures offered are 3500K and 4000K. Consult factory for all other color temperature options. 80 CRI (Minimum). RoHS Compliant.
- Always consult factory for the latest developments and improvements concerning LEDs and Optics.

DRIVERS

- Electronic, high efficiency, programmable, linear, constant current type. Universal voltage 120v–277v (Standard)
- Features include constant lumen maintenance, end of life indication and LED thermal protection.
- 0-10v dimmable. 10%–100% dimming (Standard) / 1%–100% dimming (Optional).
- Factory programmed drive current, Dim to Off function, Soft Start function.
- Step-Dim and Line Voltage Dimming Drivers are optional.
- Auxiliary output (Optional) used to power various sensors / wireless modules.
- Suitable for dry and damp locations.
- UL/CUL Class 2 Recognized, RoHS Compliant.

LENS (DIFFUSER)

- Extruded, clear, 100% virgin acrylic, linear ribbed with pattern 12 prismatic embossment (Standard).
- 30% DR additive used to increase resistance to breakage (Optional).
- Optional frosted lens / diffuser manufactured from extruded, 100% virgin acrylic & high light transmission / LED diffusing polymer featuring linear ribbed pattern, which provides a clean, aesthetic architectural look.

MOUNTING

- Fixtures are designed to be surface mounted, or suspended using pendant, aircraft cable, or jack chain. Consult factory for all other special mounting conditions.

ELECTRICAL

- Surface Mount Fixtures are UL/CUL listed and labeled for dry/damp locations.
- LM80 performance for 50,000+ hours
- Bi-Level dimming option allows 50% power for compliance with common energy codes.
- Driver disconnect provided where required to comply with US & Canadian codes.

QUALITY CONTROL

- All fixtures are designed, fabricated, assembled, tested, packaged and shipped from RENOVA's manufacturing facility in Mansfield, MA (USA).

WARRANTY

- 5-year limited warranty. Please refer to RENOVA's website at www.renova.com/sales/warranties for the latest warranty terms and conditions.

NOTES:

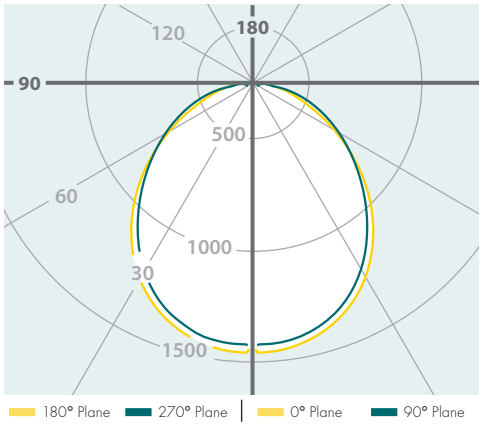
LED Dimming Drivers have adjustable output capability. A wide range of input watts/lumen output can be adjusted up or down on all models to suit a particular application. Always consult factory for the latest information.

Photometric data, IES files and all other information is available on request.

RENOVA products are constantly being improved; therefore the information shown is subject to change without notice. Always consult your lighting representative or RENOVA Lighting Systems, Inc. for the latest information.

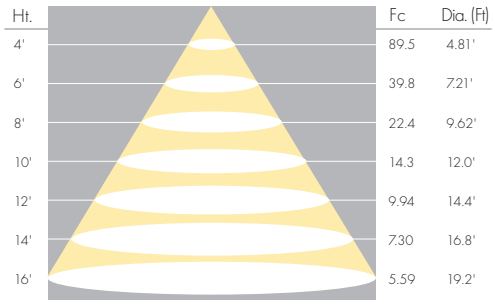
Catalog #: NPW4-N-L037-UNV-DM-C40-AF-XX-XX
Photometric Test Report #: 11201679-1231475
Delivered Lumens: 3738
Efficacy (Lumens/Watt): 137.8
Power: 27.13w @ 120 VAC
Power Factor: 0.996
Current THD: 5.72%
CRI: 83.7
CCT: 3988 K
LED Life: 50,000+ hrs

Candela Distribution Polar Plot



Spacing/Mounting Height: 1.22
SC (Along): 1.22 SC (Across): 1.22

Cone of Light Tabulation



Utilization of Lumens - Zonal Cavity Method

Effective Floor Cavity Reflectance 20%

Ceiling Cavity Reflectance	80				70				50		
Wall Reflectance	70	50	30	10	70	50	30	10	50	30	10
Room Cavity Ratio (RCR)	** Values are expressed as Lumens delivered to the task surface **										
0	4428	4428	4428	4428	4315	4315	4315	4315	4103	4103	4103
1	4042	3863	3703	3558	3931	3769	3624	3491	3594	3474	3365
2	3687	3382	3130	2918	3580	3304	3073	2876	3157	2963	2796
3	3371	2984	2684	2445	3271	2918	2641	2417	2794	2558	2363
4	3095	2655	2333	2087	3003	2600	2300	2068	2495	2235	2030
5	2853	2382	2052	1809	2769	2335	2026	1795	2246	1975	1767
6	2640	2151	1823	1588	2563	2111	1802	1577	2035	1761	1556
7	2452	1956	1635	1409	2383	1922	1617	1401	1857	1584	1385
8	2286	1789	1477	1262	2223	1760	1463	1256	1703	1435	1243
9	2138	1646	1344	1140	2081	1620	1332	1135	1571	1308	1124
10	2007	1521	1230	1037	1955	1499	1220	1032	1456	1200	1024

Average Luminance (cd/m²)

Horizontal Angle (Degrees)

Angle	Along	45.0	Across
0	5604	5604	5604
45	4542	3953	3797
55	3869	3309	3257
65	3143	2711	2822
75	2349	2165	2446
85	1335	1608	2052

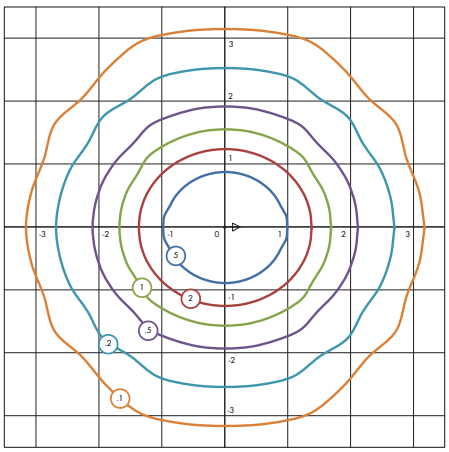
Zonal Lumen Summary

Zone	Lumens	% Luminaire
0-30	1093	29.2%
0-40	1752	46.9%
0-60	2918	78.1%
0-90	3648	97.6%
40-90	1896	50.8%
60-90	730	19.5%
90-180	90	2.4%
0-180	3738	100.0%

Luminaire Efficacy (Lumens Per Watt): 139.1

Horizontal Footcandles

Mounting Height = 8'-0' A.F.F.
Maximum Calculated Value = 18.43 Fc



Grid Lines in Units of Mounting Height

5 fc | 2 fc | 1 fc | .5 fc | .2 fc | .1 fc

NPW Fixtures Listed on the DLC Qualified Products List (QPL)

RENOVA Catalog Number	Delivered Lumens	Input Watts	Lumens per Watt	DLC – QPL Classification
NPW2-N-L015-UNV-DM-C35-AP-xx-xx	1469	11.62	126.41	Premium
NPW2-N-L015-UNV-DM-C35-AF-xx-xx	1464	11.47	127.63	Premium
NPW2-N-L015-UNV-DM-C40-AP-xx-xx	1488	11.77	126.42	Premium
NPW2-N-L015-UNV-DM-C40-AF-xx-xx	1483	11.77	125.99	Premium

RENOVA Catalog Number	Delivered Lumens	Input Watts	Lumens per Watt	DLC – QPL Classification
NPW4-N-L015-UNV-DM-C35-AP-xx-xx	1505	12.02	125.24	Premium
NPW4-N-L015-UNV-DM-C35-AF-xx-xx	1523	12.02	126.81	Premium
NPW4-N-L015-UNV-DM-C40-AP-xx-xx	1544	12.02	128.53	Premium
NPW4-N-L015-UNV-DM-C40-AF-xx-xx	1562	12.02	130.03	Premium
NPW4-N-L020-UNV-DM-C35-AP-xx-xx	2067	15.35	134.71	Premium
NPW4-N-L020-UNV-DM-C35-AF-xx-xx	2092	15.35	136.29	Premium
NPW4-N-L020-UNV-DM-C40-AP-xx-xx	2122	15.35	138.25	Premium
NPW4-N-L020-UNV-DM-C40-AF-xx-xx	2146	15.35	139.86	Premium
NPW4-N-L030-UNV-DM-C35-AP-xx-xx	3048	22.17	137.50	Premium
NPW4-N-L030-UNV-DM-C35-AF-xx-xx	3084	22.17	139.11	Premium
NPW4-N-L030-UNV-DM-C40-AP-xx-xx	3128	22.17	141.11	Premium
NPW4-N-L030-UNV-DM-C40-AF-xx-xx	3164	22.17	142.76	Premium
NPW4-N-L040-UNV-DM-C35-AP-xx-xx	3971	29.52	134.54	Premium
NPW4-N-L040-UNV-DM-C35-AF-xx-xx	4018	29.52	136.11	Premium
NPW4-N-L040-UNV-DM-C40-AP-xx-xx	4075	29.52	138.07	Premium
NPW4-N-L040-UNV-DM-C40-AF-xx-xx	4123	29.52	139.68	Premium

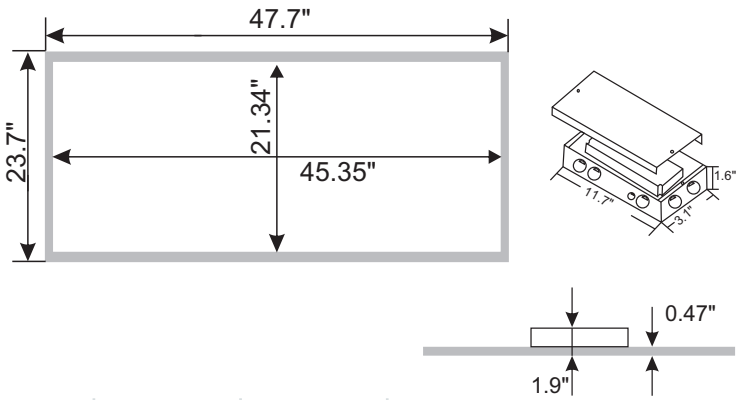
RENOVA Catalog Number	Delivered Lumens	Input Watts	Lumens per Watt	DLC – QPL Classification
NPW8-N-L030-UNV-DM-C35-AP-xx-xx	3235	21.98	147.19	Premium
NPW8-N-L030-UNV-DM-C35-AF-xx-xx	3273	21.98	148.91	Premium
NPW8-N-L030-UNV-DM-C40-AP-xx-xx	3320	21.98	151.05	Premium
NPW8-N-L030-UNV-DM-C40-AF-xx-xx	3358	21.98	152.82	Premium
NPW8-N-L040-UNV-DM-C35-AP-xx-xx	4235	29.03	145.90	Premium
NPW8-N-L040-UNV-DM-C35-AF-xx-xx	4285	29.03	147.61	Premium
NPW8-N-L040-UNV-DM-C40-AP-xx-xx	4346	29.03	149.73	Premium
NPW8-N-L040-UNV-DM-C40-AF-xx-xx	4397	29.03	151.48	Premium
NPW8-N-L060-UNV-DM-C35-AP-xx-xx	6195	43.66	141.91	Premium
NPW8-N-L060-UNV-DM-C35-AF-xx-xx	6268	43.66	143.56	Premium
NPW8-N-L060-UNV-DM-C40-AP-xx-xx	6358	43.66	145.63	Premium
NPW8-N-L060-UNV-DM-C40-AF-xx-xx	6432	43.66	147.33	Premium
NPW8-N-L080-UNV-DM-C35-AP-xx-xx	8029	59.00	136.09	Premium
NPW8-N-L080-UNV-DM-C35-AF-xx-xx	8123	59.00	137.68	Premium
NPW8-N-L080-UNV-DM-C40-AP-xx-xx	8239	59.00	139.66	Premium
NPW8-N-L080-UNV-DM-C40-AF-xx-xx	8336	59.00	141.29	Premium

FPL1-LED SERIES

FLAT LED PANEL SERIES

2X4 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER:	
PROJECT NAME:	TYPE:



3000 LUMENS	4000 LUMENS	5000 LUMENS	6000 LUMENS
30 WATT	40 WATT	50 WATT	65 WATT

The FPL1-LED flat led panel are DLC Listed, delivers high Lumen of exceptional 80+ CRI light while achieving 98 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature. Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling. This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 24-FPL1-LED-6000L-DIM10-MVOLT-40K

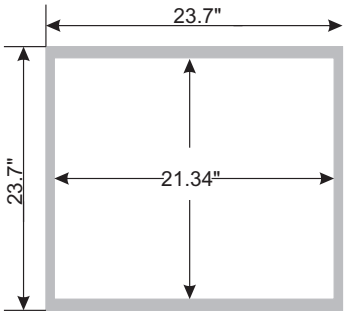
FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
24 - 2' X 4'	**FPL1**-Oracle Flat LED Panel	**LED**	**3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens) **6000L** - (6000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**24-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

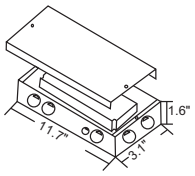
FPL1-LED SERIES

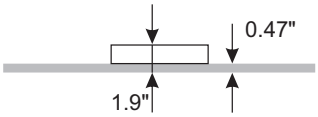
FLAT LED PANEL SERIES

2X2 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER	
PROJECT NAME:	TYPE:







2000 LUMENS	3000 LUMENS	4000 LUMENS	5000 LUMENS
20 WATT	30 WATT	40 WATT	52 WATT

The FPL1-LED flat led panel are DLC Listed,delivers high Lumen of exceptional 80+ CRI light while achieving 106 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature.Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling.This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

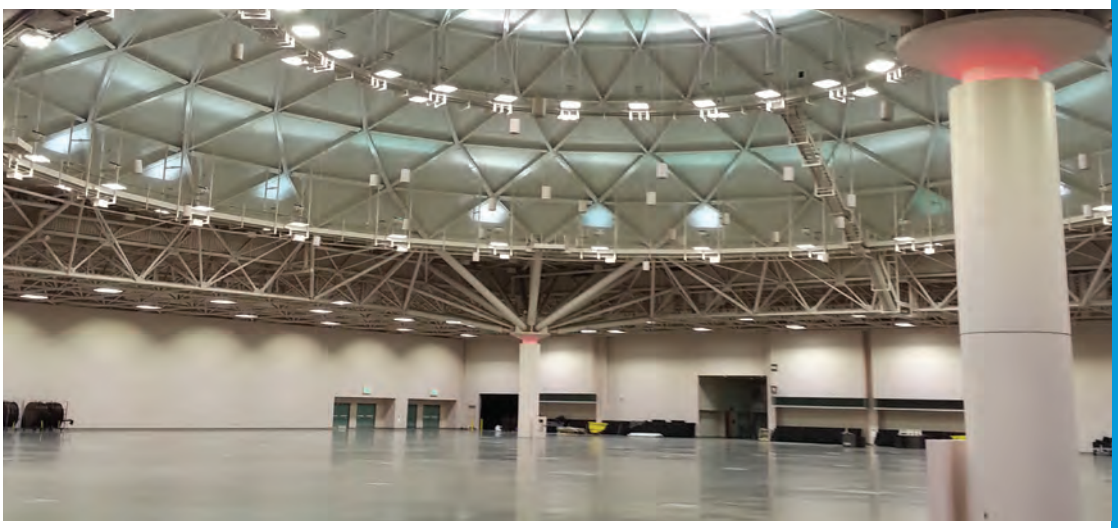
PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 22-FPL1-LED-5000L-DIM10-MVOLT-40K

FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
22- 2' X 2'	**FPL1**-Oracle Flat LED Panel	**LED**	**2000L** - (2000 lumens) **3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**22-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

ESSENTIALS SERIES

The award-winning Flex Lighting Solutions Essentials family of LED fixtures provide superior optical performance, quality and versatility for low and high bay applications. With industry-leading fixture efficacy of up to 176 lm/W and up to 80% lower power consumption compared to traditional lighting, Flex Lighting Solutions' Essentials Series LED low-bays and high-bays are designed to provide you with the lowest total cost of ownership (TCO).



- » Multiple lumen options (7,000-70,000)
- » 4000K or 5000K CCT standard
- » Clear and frosted polycarbonate lenses available
- » Aisle lighter distribution available
- » Supports 120–480V inputs
- » Cable, stem or surface mounting options available
- » 95% Initial Light Output at 5 Years*
- » 85% Initial Light Output at 10 Years*
- » Ambient temperature:** -40°C (-40°F) to 55°C (131°F)
- » 5-Year standard, up to 10-year optional warranty

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
7000	6862	44	ES3P-2MS	155
	7040	51	ES3V-2MS	137
12000-14000	12119	69	ES3PE-6MS	176
	13201	98	ES3PH-2MS	135
	13521	86	ES3P-4MS	158
	13521	86	ES3P-2M	158
	14039	100	ES3V-4MS	141
	14039	100	ES3V-2M	141
17000-20000	17125	132	ES3VH-4MS	130
	17154	113	ES3PH-4MS	152
	20838	130	ES3P-6MS	161
	20880	146	ES3V-6MS	143

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
24000-28000	25031	190	ES3VU-6MS	132
	25167	184	ES3PK-4MS	137
	25918	170	ES3PU-6MS	152
	27042	171	ES3P-4M	158
	28078	200	ES3V-4M	141
35000-42000	35635	244	ES3PH-6MS	146
	40186	280	ES3PU-4M	143
	41676	259	ES3P-6M	161
	41759	293	ES3V-6M	143
48000-50000	50344	367	ES3VU-6M	137
	51835	341	ES3PU-6M	152
70000	71270	489	ES3PH-6M	146

[1] Typical at 277V (LV) and 77°F (25°C), 5000CCT, Clear Lens, +/-7%. Typical CRI80+. Frosted Lens Multiplier is .94, 4000K Multiplier is .92, Aisle Lens Multiplier is .91.

* Based on 24/7 operation. Standard models (P, V, E). H and U models may have decreased performance.

** MBR fixtures Max Temp 5°C less, typical. Max: 50°C (122°F) for ES3PH-6M, ES3PH-6MS and ES3PH-2MS. EMB fixtures 32°F to 122°F (0°C to 50°C). Temperatures below -20° have limited switch cycles, consult factory.

Ordering Example:

ES3P-A-2MS-50-WIDE-CL-LV-MBR-10V-OCCN-CORDN-EMBN

Series-Compliance-Model

ES3P-A-2MS (6862 lm, 44W)	**ES3V-A-4MS** (14039 lm, 100W)	**ES3VU-A-6MS** (25031 lm, 190W)	**ES3PU-A-4M** (40186 lm, 280W)
ES3V-A-2MS (7040 lm, 51W)	**ES3V-A-2M** (14039 lm, 100W)	**ES3PK-A-4MS** (25167 lm, 184W)	**ES3P-A-6M** (41676 lm, 259W)
ES3PE-A-6MS (12119 lm, 69W)	**ES3VH-A-4MS** (17125 lm, 132W)	**ES3PU-A-6MS** (25918 lm, 170W)	**ES3V-A-6M** (41759 lm, 293W)
ES3PH-A-2MS (13201 lm, 98W)	**ES3PH-A-4MS** (17154 lm, 113W)	**ES3P-A-4M** (27042 lm, 171W)	**ES3VU-A-6M** (50344 lm, 367W)
ES3P-A-4MS (13521 lm, 86W)	**ES3P-A-6MS** (20838 lm, 130W)	**ES3V-A-4M** (28078 lm, 200W)	**ES3PU-A-6M** (51835 lm, 341W)
ES3P-A-2M (13521 lm, 86W)	**ES3V-A-6MS** (20880 lm, 146W)	**ES3PH-A-6MS** (35635 lm, 244W)	**ES3PH-A-6M** (71270 lm, 489W)

Color Temp[1]

40
4000K

50
5000K

Other CCT Available upon request

Distribution

Wide
Wide Distribution

Aisle[10]
Aisle Distribution

Lens

CL
Clear Lens

FR
Frosted Lens

Voltage

LV
120-227V

HV
347-480V

Mounting

CRM[6]
Cable Ready (Standard) and has center opening to accept 3/4" stem

MBR[1]
Includes fixture mounting box and bracket for surface mount applications Adds 1.125" to fixture height

HOOK[1]
Field installed mounting kit, includes hook and one pair of levleing cables for hook/loop applications

MBRWT
Includes field installed MBR with factory installed balancing weight

HKWT[1]
Mounting kit including field installed hook and factory installed balancing weight

Dimming

10V
0–10V Interface (standard)

OCC Sensors

OCCN
No Sensor (standard)

OCC8[1]
Occ Sensor, on/off 8' Mounting Height

OCC20[1, 2]
Occ Sensor, on/off 20' Mounting Height

OCC40[1, 2]
Occ Sensor, on/off 40' Mounting Height

OCCDIM8[1, 4, 5]
Occ Sensor, dimmable 8' Mounting Height

OCCDIM20[1, 4, 5]
Occ Sensor, dimmable 20' Mounting Height

OCCDIM40[1, 4, 5]
Occ Sensor, dimmable 40' Mounting Height

DAINT[1, 3, 4,9]
Kit includes Daintree Wireless Fixture

DAINTR[1, 3, 4, 9]
Fixture is Factory Wired for easy integration of Daintree Wireless Controls

Cord & Plug

CORDN
No cord/plug (standard)

C6W[1, 8]
6ft cord, 15A, no plug

C15W[1,8]
15ft cord, 15A, no plug

C515[1, 8]
6ft cord, 15A, straight plug 120V (5-15P)

CL515[1,8]
6ft cord, 15A, locking plug 120V (L5-15P)

CL715[1, 8]
6ft cord, 15A, locking plug 277V (L7-15P)

CL720[1, 8]
6ft cord, 20A, locking plug 277V (L7-20P)

CL2420[1, 8]
6ft cord, 20A, locking plug 347V (L24-20P)

CL820[1,8]
6ft cord, 20A, locking plug 480V (L8-20P)

Battery Backup

EMBN
No emergency battery back-up available (standard)

EMBR[1, 4, 7, 9]
Fixture is EMB-Ready, with test button, indicator lamp and wiring harness factory installed

Option

OPTN
No Option

QDC
Driver Quick Disconnect

PROLV
Fixture installed Surge Protector 120-277V

PROHV
Fixture installed Surge Protector 347-480V

QDLV
Quick Disconnect with LV Surge Protector

QDHV
Quick Disconnect with HV Surge Protector

When submitting for utility incentives and rebates, please use part numbers. Please see our DLC Cross Reference Part Number Guide for mating the Catalog Ordering Code to the corresponding part number at www.flexlightingsolutions.com/pdf/DLC/ES3-DLC-CrossRef.pdf

[1] Optional add-on. See price list for pricing.

[2] Optional add-on for 120-277V only. High voltage options available as special order with longer lead time. Contact factory for pricing and lead time.

[3] Daintree options do not include Daintree ControlScope SoftwareTM, wireless connection hardware/infrastructures, or field commissioning. Consult Daintree for more information and ordering assistance.

[4] Optional add-on available in 120-277V only.

[5] Wireless programmer required for final field setup. See ACCESSORIES.

[6] Optional CABLEKIT ordered separately. See ACCESSORIES.

[7] Field installed EMB KIT must be ordered with this option. See ACCESSORIES.

[8] All cords are 16/3 AWG, 600V, and white.

[9] Consult factory for orders requiring DAINTR and EMBR.

[10] Aisle Lens option available in Clear only

UTILITY DRUM CIRCULAR LED CEILING FIXTURE | POWERED BY OUR LEDCR®

Perfect for hallways, stairwells and entry ways. The fixture is designed to safely and quickly replace any existing incandescent or fluorescent fixture. Includes all of the mounting hardware and electrical connections required. Optional integrated occupancy sensor dims fixture to low energy mode when space is unoccupied.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

MANUFACTURER	MODEL NUMBER	SIZE	LUMENS	COLOR TEMP	OPTIONS
RPT	DRUM				
		11IN	900LM	3000K*	**OCC** HI/LO VARIABLE OCCUPANCY SENSOR
		14IN	1600LM	4000K	**10VDIM** 0-10V DIMMABLE
			2200LM		**EMG** EMERGENCY BATTERY BACKUP
			3000LM		**120 LVD** TRIAC/PHASE DIMMABLE
					277 LVD TRIAC/PHASE DIMMABLE

ORDERING EXAMPLE

RPT-DRUM-11IN-900LM-3000K-OCC

* 3000K part number can be used for 3000-3500K

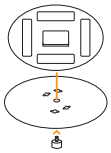
LEDCR LIGHT ENGINE

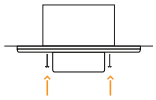
The Designer Drum is powered by our patented, infield replacable and upgradable light engine. See LEDCR cut sheet for more information.

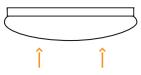
INSTALLATION GUIDE

1. 

Turn off power to the fixture.

2. 
Make connections & using provided brass nut, tighten LEDCR plate onto fixture.

3. 
Install LEDCR/fixture base assembly to existing junction box using longer provided screws.

4. 
Install fixture lens, turn on power.

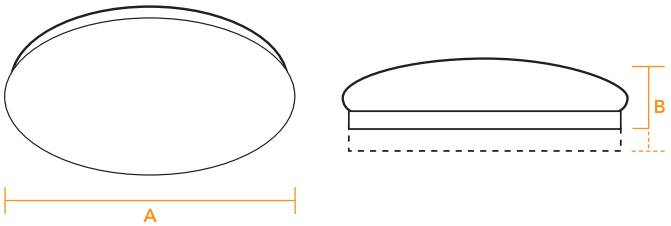
Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC
EFFICACY	>120 LPW @ 4000K
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	85+
WARRANTY	5 years
CERTIFICATIONS	
PERFORMANCE LISTINGS	

May be protected under the following US patents
US 8,106569 | US 8,882,298 | Additional patents pending.

DIMENSIONS



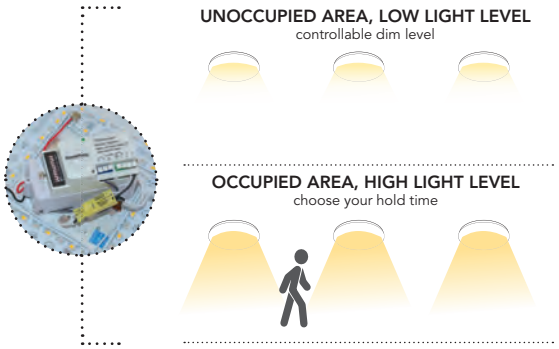
DIMENSIONS (INCHES)	A	B
RPT-DRUM-11IN (without optional EMG)	11	3.5
RPT-DRUM-11IN (with optional EMG)	11	5
RPT-DRUM-14IN (without optional EMG)	14	3.5
RPT-DRUM-14IN (with optional EMG)	14	5

UTILITY DRUM CIRCULAR LED CEILING FIXTURE | POWERED BY OUR LEDCR®

ORDERING GUIDE

QUICK SHIP	DLC E*	PART #	FIXTURE LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
X	E*	RPT-DRUM-11IN-900LM-3000K	710	7	3000-3500	120-277	5	2 x CFL (30W)	23
	E*	RPT-DRUM-11IN-900LM-4000K	760	7	4000	120-277	5	2 x 13W CFL (30W)	23
X	E*	RPT-DRUM-11IN-1600LM-3000K	1250	12	3000-3500	120-277	5	3 x 13W CFL (45W)	33
X	DLC/E*	RPT-DRUM-11IN-1600LM-3000K-OCC	1250	14hi/3lo	3000-3500	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-11IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
X	DLC/E*	RPT-DRUM-11IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-11IN-2200LM-3000K	1800	18	3000-3500	120-277	5	2 x 26W CFL (54W)	36
X	DLC/E*	RPT-DRUM-11IN-2200LM-3000K-OCC	1800	20hi/4lo	3000-3500	120-277	5	2 x 26W CFL (54W)	34hi/50lo
X	E*	RPT-DRUM-11IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
X	DLC/E*	RPT-DRUM-11IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
X	E*	RPT-DRUM-14IN-1600LM-3000K	1250	12	3000-3500	120-277	5	3 x 13W CFL (45W)	33
X	DLC/E*	RPT-DRUM-14IN-1600LM-3000K-OCC	1250	14hi/3lo	3000-3500	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-14IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
X	DLC E*	RPT-DRUM-14IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-14IN-2200LM-3000K	1800	18	3000-3500	120-277	5	2 x 26W CFL (54W)	36
X	DLC E*	RPT-DRUM-14IN-2200LM-3000K-OCC	1800	20hi/4lo	3000-3500	120-277	5	2 x 26W CFL (54W)	34hi/50lo
X	E*	RPT-DRUM-14IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
X	E*	RPT-DRUM-14IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
	E*	RPT-DRUM-14IN-3000LM-3000K	2400	27	3000-3500	120-277	5	3 x 26W CFL (80W)	53
	E*	RPT-DRUM-14IN-3000LM-4000K	2500	27	4000	120-277	5	3 x 26W CFL (80W)	53

OPTIONAL FACTORY INSTALLED OCC SENSOR



The LEDCR can be paired with our integral occupancy sensor for maximum energy savings. Unlike traditional passive infrared or ultrasonic occupancy sensors, this high-frequency sensor can be hidden behind the lens of an existing fixture, eliminating the need for external sensors and providing a clean look.

OPTIONAL FACTORY INSTALLED EMG BACKUP

The LEDCR can be paired with an Emergency battery backup. Provides over 90 minutes of safe light levels when power goes out.

RemPhos TECHNOLOGIES

RemPhos Technologies LLC • p 877.997.3674 • www.remphos.com
90 Holten Street • Danvers, MA USA • sales@remphos.com

BR40 14W DIM. TITANIUM LED SERIES

GREENCREATIVE

PRO

CLOUD DESIGN

14W REPLACES

85W Inc.

80% Energy Savings

$239 Savings per lamp*

- Revolutionary CLOUD design
- 55% lighter due to environmentally friendly construction
- Exceptional efficacy 79 LPW in Soft White
- Smooth dimming with existing installations
- Accurate color rendering CRI 82
- Soft White & Warm White CCT

25,000 H

DIMMABLE

79 LPW EFFICACY

3 YR WARRANTY

82 CRI (Ra)

ENCLOSED**

c UL us LISTED

FC

lighting facts LED Product Partner

LM 79

LM 80

TM 21

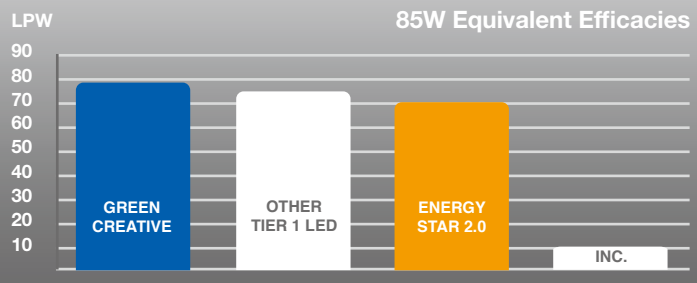
IES

BR PRODUCT FEATURES

Revolutionary CLOUD Design

The BR40 CLOUD features an innovative design that provides more efficient light output than previous generations while using 35% less material. This environmentally friendly lamp weighs less than 175g and maintains a traditional incandescent form factor, making it suitable for all applications.

Exceptional Efficacy



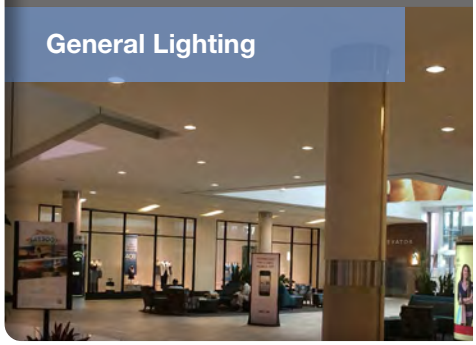
At 79 LPW, this lamp's efficacy is higher than the Tier 1 LED BR40 85W replacement industry average and exceeds the new ENERGY STAR 2.0 requirements. This energy-saving performance makes this lamp a smart retrofit choice for incandescent bulbs.

BR40 14W DIM. TITANIUM LED SERIES

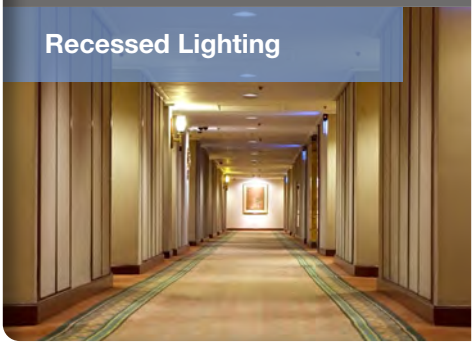
GREENCREATIVE

APPLICATIONS

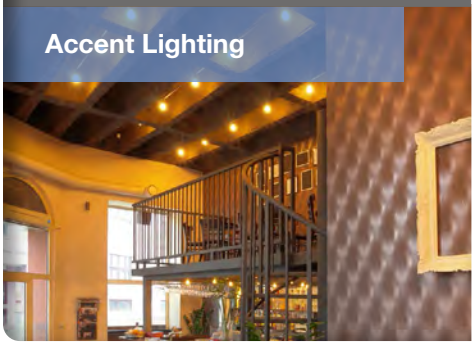
General Lighting



Recessed Lighting



Accent Lighting



Ref.#: DS169-B430-14W

SPECIFICATIONS

Product Model	40636 14BR40DIM/827	40637 14BR40DIM/830
Type	BR40	BR40
Base	E26	E26
Power (W)	14	14
Voltage - Frequency	120V 60Hz	120V 60Hz
Color Temp. (ANSI)	Soft White 2700K	Warm White 3000K
CRI (Ra)	82	82
Typical lumens (lm)	1100	1140
Efficacy (LPW)	79	81
Beam Angle	110°	110°
Dimmable	Yes***	Yes***
Power Factor	0.9	0.9
Rated Lifetime - L70 (hrs.)	25,000	25,000
Dia. x MOL	4.92''x6.10'' (125x155mm)	4.92''x6.10'' (125x155mm)
Weight (lb. / g)	0.38lb. / 172g	0.38lb. / 172g

* Savings per lamp based on $0.11 / kw energy cost, 12 hrs / day lamp usage, $4 incandescent with 1000-hr lifetime, $20 LED with 25,000-hr lifetime
** Suitable for use in totally enclosed fixtures
*** List of tested dimmer switches available on website
**** Suitable for damp locations. Not for use where directly exposed to weather or water

HID LED 45W TITANIUM LED SERIES

GREENCREATIVE

PRO

45W REPLACES

100-175W HID

70% Energy Savings

$289 Savings per lamp*

- **Direct line voltage 120-277V - Not compatible with ballasts**
- **Designed for use in post top applications**
- **Compatible with EX39 & E39 sockets**
- **Fully omnidirectional 320° beam angle**
- **Available in 3000K, 4000K & 5000K CCT**
- **Suitable for use in totally enclosed fixtures**

50,000 H

120-277V UNIVERSAL

OMNI DIRECTIONAL

5 YR WARRANTY

80 CRI (Ra)

ENCLOSED**

LM 79 LM 80 TM 21 IES

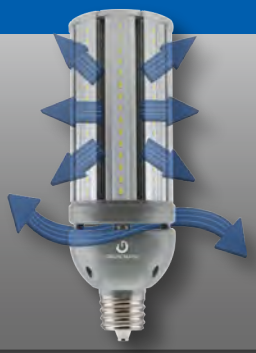
HID LED PRODUCT FEATURES

Suitable for Enclosed Fixtures

This HID LED lamp replaces a 100-175W HID and is suitable for use in totally enclosed fixtures. Its high lumen output and exceptional efficacy make it an ideal choice for outdoor post top applications.

CoolSink Technology

The CoolSink passive cooling system allows air to flow freely through the lamp. This unique design uses an increased cooling surface area to reduce the operating temperature of the LED and power supply, thus resulting in longer lamp life and lumen maintenance.

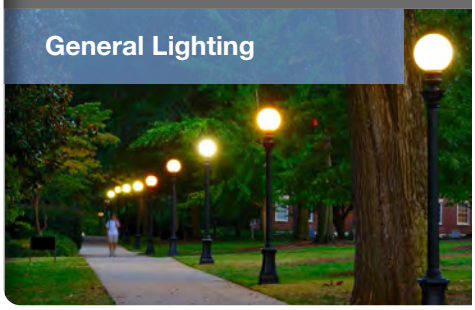


HID LED 45W TITANIUM LED SERIES

GREENCREATIVE

APPLICATIONS

General Lighting



Teardrop Lighting

Post Top Lighting

Ref.#DS131-HID-LED-45W-277V

SPECIFICATIONS

Product Model	57938 45HID/830/277V/EX39	57939 45HID/840/277V/EX39/R	57940 45HID/850/277V/EX39
Type	HID LED	HID LED	HID LED
Base	EX39 (Compatible with E39)	EX39 (Compatible with E39)	EX39 (Compatible with E39)
Power (W)	45	45	45
Voltage - Frequency	100-277V	100-277V	100-277V
Color Temp. (ANSI)	Warm White 3000K	Cool White 4000K	Daylight 5000K
CRI (Ra) (typ.)	80	80	80
Bare Lamp lumens (lm)	5040	5350	5400
Bare Lamp efficacy (LPW)	112	119	120
Fixture lumens (lm)* **	3000	3000	3000
Fixture efficacy (LPW)* **	67	67	67
Beam Angle	320°	320°	320°
Dimmable	No	No	No
Power Factor	0.9	0.9	0.9
Rated Lifetime - L70 (hrs.)	50,000	50,000	50,000
Dia. x MOL	3.66''x11.34'' (93x288mm)	3.66''x11.34'' (93x288mm)	3.66''x11.34'' (93x288mm)
Weight (lb. / g)	2.2lbs / 1033g	2.2lbs / 1033g	2.2lbs / 1033g

HID EQUIVALENCE

GREEN CREATIVE HID LED		Metal Halide		Mercury Vapor		High Pressure Sodium	
Power	**Lumens**	**Power**	**Mean Lumens**	**Power**	**Mean Lumens**	**Power**	**Mean Lumens**
45W	**5400**	**100W**	**5800**	**175W**	**6250**	**70W**	**5350**

* Savings per fixture based on $0.11 / kw energy cost, 12 hrs / $12 HID with 10,000-hr lifetime, $70 ballast, $90 LED HID with 50,000 hr lifetime
** Suitable for use in totally enclosed fixtures

*** Fixture lumens and efficacy based on DLC testing in Post Top fixture with prismatic diffuser: GE Patriarch Luminaire
**** Suitable for damp locations. Not for use where directly exposed to weather or water
***** Suitable for use in horizontal applications

Appendix A4

November 2, 2016

Ms. Axum Teferra
Energy Planner
Metropolitan Area Planning Council
60 Temple Place, Boston, MA 02111

Subject: Town of Medfield estimates for EMS and DHW measures

Dear Ms. Teferra,

RISE Engineering is pleased to provide this summary of the estimated costs, incentives, and savings for the EMS and DHW measures in various Town of Medfield buildings.

EMS Retro-commissioning and/or Upgrades:

As discussed on the phone, these Energy Management Systems (EMS – or sometimes called Building Automation System or BAS) cost estimates are engineering estimates that are based upon typical situations in similar buildings. Prior to moving to implementation, Medfield needs to obtain firm quotes. It is also important to note that the retro-commissioning process is likely to uncover numerous EMS components or related devices that have failed and may need to be repaired or replaced. The cost of such repairs or replacements are not included here because a) it is not possible to accurately estimate what has failed at this time and b) those costs are not likely to be eligible for utility incentives as they would be considered repairs that do not directly provide energy savings.

Medfield - EMS Retrocommisioning/Upgrades Summary						11/2/2016
Building / Scope	Estimated Cost	Annual Therm Savings	Annual kWh Savings	Annual Energy $ Savings	Total Estimated Incentive	Estimated Net Cost
High School / Retrocommissioning	$50,000	2,959	13,917	$5,908	$5,221	$44,779
Blake Middle School / Retrocommissioning	$25,000	2,754	2,008	$3,521	$3,546	$21,454
Memorial Elementary / Upgrade + RetroCX	$100,000	1,520	6,127	$2,850	$9,759	$90,241
Town Hall / Retrocommissioning	$15,000	212	3,212	$758	$640	$14,360
Public Library / Install EMS	$50,000	213	2,605	$685	$9,600	$40,400

The retro-commissioning incentives assume the “Pay For Performance” model in which the incentive is directly linked to actual savings demonstrated over a 1 year period. So, the actual incentive will vary, and may very well be higher. For the Upgrade or Install incentives, it is assumed that prescriptive incentives of $300 per point will be available for each new point installed that controls energy saving components.

DHW Upgrades:

RISE Engineering is the direct installation vendor for Columbia Gas of Massachusetts and has staff available to install these Domestic Hot Water (DHW) measures at pre-approved pricing. The costs shown are the program unit prices multiplied by estimated quantities. The savings are "deemed" savings values from the MA TRM multiplied by the estimated quantities. The actual installed quantities may vary. Columbia Gas generally provides 100% of the cost of these measures if the Town accepts the pre-approved Program products. Custom products that cost more are generally provided an incentive of up to 50% of the cost. For the buildings with electrically heated DHW, we will need to apply as a custom incentive as a similar program is not in place for electric DHW in commercial buildings.

Medfield - DHW Upgrades Summary						11/2/2016
Building / Scope	Estimated Cost	Annual Therm Savings	Annual kWh Savings	Annual Energy $ Savings	Total Estimated Incentive	Estimated Net Cost
Town Hall / low flow aerators (electric DHW)	$132	0	5,976	$956	$0	$132
Public Library / low flow aerators (electric DHW)	88	0	3984	637	0	$88
Dale Street Elementary / low flow aerators	$264	408	0	$469	$264	$0
Dale Street Elementary / spray valve	$150	114	0	$131	$150	$0
Memorial Elementary / low flow aerators	$275	425	0	$489	$275	$0
Memorial Elementary / spray valve	$150	114	0	$131	$150	$0
Wheelock Elementary / low flow aerators	$220	340	0	$391	$220	$0
Wheelock Elementary / spray valve	$150	114	0	$131	$150	$0
High School / low flow aerators	$264	408	0	$469	$264	$0
High School / low flow showerheads	$700	530	0	$609	$700	$0
High School / spray valve	$150	114	0	$131	$150	$0
Blake Middle School / low flow aerators	$220	340	0	$391	$220	$0
Blake Middle School / low flow showerheads	$350	265	0	$305	$350	$0
Blake Middle School / spray valve	$150	114	0	$131	$150	$0

RISE has included the above information in the Energy Assessment reports previously provided for the High School, Middle School, and the Public Library. The above information will also be included in the Energy Assessment reports for the remaining buildings.

RISE Engineering, a division of Thielsch Engineering, Inc., is one of the leading energy efficiency organizations in the country. Founded in 1977, RISE has provided services to over 500,000 commercial, industrial, multifamily, institutional and residential buildings. Our mission is to deliver "one-stop" services to help make building environments more efficient, durable, healthful, and affordable.

Please direct any questions you may have regarding this proposal to me at (401) 784.3700 ext. 6184 or at SNutter@RISEengineering.com .

Sincerely,

Sam Nutter
Director, Gas Program Services

Appendix A5

RISE ENGINEERING™
Division of Thielsch Engineering, Inc
1341 Elmwood Avenue
Cranston, Rhode Island 02910

EVERSOURCE

Medfield High School LED Lighting Upgrades

LED TUBES/BYPASS BALLASTS & LED RECESSED FLAT PANELS

Financial Summary

Total Project Cost	**$**	**241,533**
Estimated Electric Incentive	**$**	**(78,987)**
Customer Net Cost	**$**	**162,546**
Estimated Energy Cost Savings Annually	**$**	**52,132**
Estimated Maintenance Savings	**$**	**8,442**
Return on Investment (ROI)		**37%**
Simple Payback in Years		**2.7**

Energy Savings

kW Reduction	kWh Reduction
87.35	**315,949**

Pollution Savings

CO2 Reduction (lbs)	NOx Reduction (lbs)	SO2 Reduction (lbs)
400,307	**339.0**	**1,252.7**

Prepared: 10/11/2016

RISE ENGINEERING

Medfield High School
88R South Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION						EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Floor	Room Number / Description	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
1	MEDFIELD HS	2	B WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	28	4836	52	1.46	7,041	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	28	4836	20	0.56	2708			0.90	4,333
2	MEDFIELD HS	2	B WING	CLASSROOMS 208-215	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	96	2856	77	7.39	21,112	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	96	2856	42	4.03	11515			3.36	9,596
3	MEDFIELD HS	2	B WING	RESTROOMS	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	4	2856	52	0.21	594	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	4	2856	28	0.11	320			0.10	274
4	MEDFIELD HS	2	B WING	RESTROOMS	D1	2X2 1L2' T8 17W/NP COVE VALANCE	2	2856	17	0.03	97	RETROFIT RPT 1L2' 9W T8 LED/BYPASS BALLAST	2	2856	9	0.02	51			0.02	46
5	MEDFIELD HS	2	B WING	COPY ROOM	B2	1X4 1L4' T8 30W/LP DIRECT/INDIRECT PENDANT	2	2856	26	0.05	149	RETROFIT RPT 1L4' 14W T8 LED/BYPASS BALLAST	2	2856	14	0.03	80			0.02	69
6	MEDFIELD HS	2	B WING	COPY ROOM	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	5	2856	77	0.39	1,100	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	5	2856	42	0.21	600			0.18	500
7	MEDFIELD HS	2	B WING	STAIRWELL	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	4	8760	77	0.31	2,698	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	4	8760	42	0.17	1472			0.14	1,226
8	MEDFIELD HS	2	A WING	ROOM 201	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	12	2856	77	0.92	2,639	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	12	2856	42	0.50	1439			0.42	1,200
9	MEDFIELD HS	2	A WING	OFFICE	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	2	2856	77	0.15	440	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	2	2856	42	0.08	240			0.07	200
10	MEDFIELD HS	2	A WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	28	4836	52	1.46	7,041	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	28	4836	20	0.56	2708			0.90	4,333
11	MEDFIELD HS	2	A WING	RESTROOMS/210 BATHROOM	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	3	2856	52	0.16	446	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	3	2856	28	0.08	240			0.07	206
12	MEDFIELD HS	2	A WING	TEACHERS CONF RM #2	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	4	2856	77	0.31	880	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	4	2856	42	0.17	480			0.14	400
13	MEDFIELD HS	2	A WING	SCIENCE OFFICE	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	4	2856	77	0.31	880	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	4	2856	42	0.17	480			0.14	400
14	MEDFIELD HS	2	A WING	ROOMS 201/203	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	16	2856	77	1.23	3,519	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	16	2856	42	0.67	1919			0.56	1,599
15	MEDFIELD HS	2	A WING	PREP ROOMS	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	12	2856	77	0.92	2,639	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	12	2856	42	0.50	1439			0.42	1,200
16	MEDFIELD HS	2	A WING	ROOMS 204-207	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	64	2856	77	4.93	14,074	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	64	2856	42	2.69	7677			2.24	6,397
17	MEDFIELD HS	2	C WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	37	4836	52	1.92	9,304	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	37	4836	20	0.74	3579			1.18	5,726
18	MEDFIELD HS	2	C WING	STORAGE	A3	1X8 4L4' T8 32W/NP STRIP	4	1000	112	0.45	448	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	4	1000	56	0.22	224			0.22	224
19	MEDFIELD HS	2	C WING	ROOM 217	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	10	2856	77	0.77	2,199	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	10	2856	42	0.42	1200			0.35	1,000
20	MEDFIELD HS	2	C WING	OFFICE	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	1	2856	52	0.05	149	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	1	1856.4	20	0.01	23	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.04	125
21	MEDFIELD HS	2	C WING	ROOM 216	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	12	2856	77	0.92	2,639	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	12	2856	42	0.50	1439			0.42	1,200
22	MEDFIELD HS	2	C WING	ENGLISH DEPT OFFICE	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	6	2856	77	0.46	1,319	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	6	2856	42	0.25	720			0.21	600
23	MEDFIELD HS	2	C WING	RESTROOMS	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	6	2856	52	0.31	891	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	6	2856	28	0.17	480			0.14	411
24	MEDFIELD HS	2	C WING	CLASSROOMS 218-227	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	120	2856	77	9.24	26,389	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	120	2856	42	5.04	14394			4.20	11,995
25	MEDFIELD HS	2	C WING	RESTROOMS	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	6	2856	52	0.31	891	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	6	2856	28	0.17	480			0.14	411
26	MEDFIELD HS	2	C WING	ROOM 229	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	18	2856	77	1.39	3,958	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	18	2856	42	0.76	2159			0.63	1,799
27	MEDFIELD HS	2	C WING	FACULTY COPY ROOM	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	2	2856	88	0.18	503	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	2856	30	0.06	171			0.12	331
28	MEDFIELD HS	2	C WING	LANGUAGE ROOM 231	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	16	2856	77	1.23	3,519	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	16	2856	42	0.67	1919			0.56	1,599
29	MEDFIELD HS	2	C WING	DATA CLOSET	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	1	1000	52	0.05	52	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	1000	28	0.03	28			0.02	24
30	MEDFIELD HS	2	E WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	26	4836	52	1.35	6,538	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	26	4836	20	0.52	2515			0.83	4,024
31	MEDFIELD HS	2	E WING	FACULTY RESTROOMS	B3	1X4 1L4' T8 30W/LP COVE VALANCE	2	2856	26	0.05	149	RETROFIT RPT 1L4' 14W T8 LED/BYPASS BALLAST	2	2856	14	0.03	80			0.02	69
32	MEDFIELD HS	2	E WING	ROOMS 230-231	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	32	2856	77	2.46	7,037	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	32	2856	42	1.34	3838			1.12	3,199
33	MEDFIELD HS	2	E WING	DEPARTMENT OFFICE	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	6	2856	77	0.46	1,319	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	6	2856	42	0.25	720			0.21	600
34	MEDFIELD HS	2	E WING	ROOM 232	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	12	2856	77	0.92	2,639	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	12	2856	42	0.50	1439			0.42	1,200
35	MEDFIELD HS	2	E WING	ROOMS 233-235	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	36	2856	77	2.77	7,917	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	36	2856	42	1.51	4318			1.26	3,599
36	MEDFIELD HS	1	E WING	MEDFIELD OUTREACH	D2	2X2 2L4' T8U 32W/NP RECESSED PARABOLIC/PRISMATIC	1	2856	60	0.06	171	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	1	1856.4	30	0.02	35	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.04	137

RISE ENGINEERING

Medfield High School
88R South Street
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ECM: LED Lighting Upgrades

LOCATION						EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Floor	Room Number / Description	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
37	MEDFIELD HS	1	E WING	MEDFIELD OUTREACH	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	7	2856	88	0.62	1,759	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	7	1856.4	30	0.13	242	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.49	1,518
38	MEDFIELD HS	1	E WING	MEDFIELD OUTREACH	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	6	2856	52	0.31	891	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	6	2856	28	0.17	480			0.14	411
39	MEDFIELD HS	1	E WING	MEDFIELD OUTREACH	B3	1X4 1L4' T8 30W/LP COVE VALANCE	1	2856	26	0.03	74	RETROFIT RPT 1L4' 14W T8 LED/BYPASS BALLAST	1	2856	14	0.01	40			0.01	34
40	MEDFIELD HS	1	E WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	24	4836	52	1.25	6,035	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	24	4836	20	0.48	2321			0.77	3,714
41	MEDFIELD HS	1	E WING	ROOMS 121, 122, 124-126	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	86	2856	77	6.62	18,912	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	86	2856	42	3.61	10316			3.01	8,597
42	MEDFIELD HS	1	E WING	KITCHEN HALL	D2	2X2 2L4' T8U 32W/NP RECESSED PARABOLIC/PRISMATIC	7	4836	60	0.42	2,031	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	7	4836	30	0.21	1016			0.21	1,016
43	MEDFIELD HS	1	E WING	BATHROOM	B3	1X4 1L4' T8 30W/LP COVE VALANCE	1	2856	26	0.03	74	RETROFIT RPT 1L4' 14W T8 LED/BYPASS BALLAST	1	2856	14	0.01	40			0.01	34
44	MEDFIELD HS	1	E WING	DRY FOOD STORAGE	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	4	1000	88	0.35	352	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	1000	30	0.12	120			0.23	232
45	MEDFIELD HS	1	E WING	KITCHEN	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	13	2856	88	1.14	3,267	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	13	2856	30	0.39	1114			0.75	2,153
46	MEDFIELD HS	1	E WING	KITCHEN	D2	2X2 2L4' T8U 32W/NP RECESSED PARABOLIC/PRISMATIC	4	2856	60	0.24	685	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	4	2856	30	0.12	343			0.12	343
47	MEDFIELD HS	1	E WING	RESTROOMS	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	2	2856	52	0.10	297	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	2856	28	0.06	160			0.05	137
48	MEDFIELD HS	1	C WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	30	4836	52	1.56	7,544	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	30	4836	20	0.60	2902			0.96	4,643
49	MEDFIELD HS	1	C WING	ROOMS 110-120	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	114	2856	77	8.78	25,070	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	114	2856	42	4.79	13675			3.99	11,395
50	MEDFIELD HS	1	C WING	SOCIAL STUDIES OFFICE	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	6	2856	77	0.46	1,319	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	6	2856	42	0.25	720			0.21	600
51	MEDFIELD HS	1	C WING	RESTROOMS	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	6	2856	52	0.31	891	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	6	2856	28	0.17	480			0.14	411
52	MEDFIELD HS	1	C WING	ROOMS 117, 119	B4	1X4 2LF40 2' BIAX 40W/NP RECESSED BASKET	22	2856	72	1.58	4,524	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	22	2856	20	0.44	1257			1.14	3,267
53	MEDFIELD HS	1	D WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	44	4836	52	2.29	11,065	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	44	4836	20	0.88	4256			1.41	6,809
54	MEDFIELD HS	1	D WING	ART OFFICE	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	2	2856	88	0.18	503	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.14	434
55	MEDFIELD HS	1	D WING	BATHROOM	D3	1X6 2L3' T8 25W/NP COVE VALANCE	2	2856	47	0.09	268	RETROFIT RPT 2L3' 12W T8 LED/BYPASS BALLAST	2	2856	24	0.05	137			0.05	131
56	MEDFIELD HS	1	D WING	PHYSICAL THERAPY	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	3	2856	52	0.16	446	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	3	2856	28	0.08	240			0.07	206
57	MEDFIELD HS	1	D WING	GYM	G1	1X4 4L4' T8 32W/HLEB HIF GYM W/ SENSOR	36	4836	156	5.62	27,159	NEW LUSIO 4MS 88W LED LOWBAY OCC40	36	4836	88	3.17	15320			2.45	11,839
58	MEDFIELD HS	1	D WING	OFFICES	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	6	2856	88	0.53	1,508	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	6	1856.4	30	0.11	207	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.42	1,301
59	MEDFIELD HS	1	D WING	OFFICES	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	4	2856	52	0.21	594	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	4	1856.4	20	0.05	92	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.16	502
60	MEDFIELD HS	1	D WING	BATHROOM	B3	1X4 1L4' T8 30W/LP COVE VALANCE	2	2856	26	0.05	149	RETROFIT RPT 1L4' 14W T8 LED/BYPASS BALLAST	2	2856	14	0.03	80			0.02	69
61	MEDFIELD HS	1	D WING	OFFICE	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	6	2856	77	0.46	1,319	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	6	2856	42	0.25	720			0.21	600
62	MEDFIELD HS	LL	D WING	CORRIDOR	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	4	4836	88	0.35	1,702	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	4836	30	0.12	580			0.23	1,122
63	MEDFIELD HS	LL	D WING	CORRIDOR	D2	2X2 2L4' T8U 32W/NP RECESSED PARABOLIC/PRISMATIC	2	4836	60	0.12	580	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	2	4836	30	0.06	290			0.06	290
64	MEDFIELD HS	LL	D WING	DAYCARE 001	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	12	2856	52	0.62	1,782	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	12	1856.4	20	0.15	276		RMJ-5T-DV-B	0.48	1,506
65	MEDFIELD HS	LL	D WING	MAINTENANCE	A3	1X8 4L4' T8 32W/NP STRIP	9	4836	112	1.01	4,875	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	9	4836	56	0.50	2437			0.50	2,437
66	MEDFIELD HS	LL	D WING	MAINTENANCE	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	9	4836	52	0.47	2,263	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	9	4836	28	0.25	1219			0.22	1,045
67	MEDFIELD HS	LL	D WING	MAINTENANCE OFFICE	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	2	4836	88	0.18	851	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	3143.4	30	0.04	117	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.14	734
68	MEDFIELD HS	LL	D WING	GENDER NEUTRAL BATHROOM	D3	1X6 2L3' T8 25W/NP COVE VALANCE	2	2856	47	0.09	268	RETROFIT RPT 2L3' 12W T8 LED/BYPASS BALLAST	2	2856	24	0.05	137			0.05	131
69	MEDFIELD HS	LL	D WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	10	4836	52	0.52	2,515	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	10	4836	20	0.20	967			0.32	1,548
70	MEDFIELD HS	LL	D WING	FITNESS CENTER 003	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	26	2856	88	2.29	6,535	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	26	1856.4	30	0.48	898		RMJ-5T-DV-B	1.80	5,637
71	MEDFIELD HS	LL	D WING	LOCKER ROOMS	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	34	4836	52	1.77	8,550	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	34	4836	28	0.95	4604			0.82	3,946
72	MEDFIELD HS	LL	D WING	OFFICES	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	4	2856	77	0.31	880	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	4	2856	42	0.17	480			0.14	400

Prepared: 10/11/2016

RISE ENGINEERING

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ECM: LED Lighting Upgrades

LOCATION						EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Floor	Room Number / Description	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
73	MEDFIELD HS	LL	D WING	BATHROOM	B3	1X4 1L4' T8 30W/LP COVE VALANCE	2	2856	26	0.05	149	RETROFIT RPT 1L4' 14W T8 LED/BYPASS BALLAST	2	2856	14	0.03	80			0.02	69
74	MEDFIELD HS	LL	D WING	TEAMROOMS	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	20	2856	52	1.04	2,970	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	20	2856	28	0.56	1599			0.48	1,371
75	MEDFIELD HS	LL	D WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	26	4836	52	1.35	6,538	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	26	4836	20	0.52	2515			0.83	4,024
76	MEDFIELD HS	LL	D WING	TRAINERS ROOM	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	4	2856	88	0.35	1,005	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	2856	30	0.12	343			0.23	663
77	MEDFIELD HS	LL	D WING	BATHROOM	D3	1X6 2L3' T8 25W/NP COVE VALANCE	1	2856	47	0.05	134	RETROFIT RPT 2L3' 12W T8 LED/BYPASS BALLAST	1	2856	24	0.02	69			0.02	66
78	MEDFIELD HS	LL	D WING	TEAM STORAGE ROOMS	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	14	1000	52	0.73	728	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	14	650	28	0.24	158	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.48	570
79	MEDFIELD HS	LL	D WING	ROOM 005	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	14	2856	77	1.08	3,079	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	14	2856	42	0.59	1679			0.49	1,399
80	MEDFIELD HS	LL	D WING	ROOM 005	A3	1X8 4L4' T8 32W/NP STRIP	1	2856	112	0.11	320	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	1	2856	56	0.06	160			0.06	160
81	MEDFIELD HS	LL	D WING	STORAGE NEAR GIRLS LOCKERS	A3	1X8 4L4' T8 32W/NP STRIP	1	1000	112	0.11	112	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	1	1000	56	0.06	56			0.06	56
82	MEDFIELD HS	LL	D WING	ELECTRIC ROOM	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	2	1000	52	0.10	104	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	1000	28	0.06	56			0.05	48
83	MEDFIELD HS	LL	D WING	CORRIDOR GYM ENTRANCE	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	20	4836	52	1.04	5,029	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	20	4836	20	0.40	1934			0.64	3,095
84	MEDFIELD HS	LL	D WING	STORAGE	A3	1X8 4L4' T8 32W/NP STRIP	1	1000	112	0.11	112	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	1	1000	56	0.06	56			0.06	56
85	MEDFIELD HS	LL	D WING	ROOMS 006-008	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	46	2856	77	3.54	10,116	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	46	2856	42	1.93	5518			1.61	4,598
86	MEDFIELD HS	LL	D WING	DEPARTMENT OFFICE	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	6	2856	77	0.46	1,319	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	6	2856	42	0.25	720			0.21	600
87	MEDFIELD HS	LL	D WING	STORAGE	A3	1X8 4L4' T8 32W/NP STRIP	1	1000	112	0.11	112	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	1	1000	56	0.06	56			0.06	56
88	MEDFIELD HS	1	D WING	LIBRARY BATHROOM	D3	1X6 2L3' T8 25W/NP COVE VALANCE	4	2856	47	0.19	537	RETROFIT RPT 2L3' 12W T8 LED/BYPASS BALLAST	4	2856	24	0.10	274			0.09	263
89	MEDFIELD HS	1	D WING	READING	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	1	2856	88	0.09	251	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	1856.4	30	0.02	35	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.07	217
90	MEDFIELD HS	1	D WING	READING	B4	1X4 2LF40 2' BIAX 40W/NP RECESSED BASKET	6	2856	72	0.43	1,234	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	6	1856.4	20	0.07	138	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.36	1,096
91	MEDFIELD HS	1	D WING	LIBRARY OFFICE	B4	1X4 2LF40 2' BIAX 40W/NP RECESSED BASKET	10	2856	72	0.72	2,056	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	10	1856.4	20	0.12	230	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.60	1,826
92	MEDFIELD HS	1	D WING	OFFICES	A3	1X8 4L4' T8 32W/NP STRIP	2	2856	112	0.22	640	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	2	2856	56	0.11	320			0.11	320
93	MEDFIELD HS	1	D WING	OFFICES	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	2	2856	88	0.18	503	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.14	434
94	MEDFIELD HS	1	D WING	MAIN FOYER RESTROOMS	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	12	2856	52	0.62	1,782	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	12	2856	28	0.34	960			0.29	823
95	MEDFIELD HS	1	B WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	22	4836	52	1.14	5,532	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	22	4836	20	0.44	2128			0.70	3,405
96	MEDFIELD HS	1	B WING	GUIDANCE	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	5	2856	88	0.44	1,257	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	5	1856.4	30	0.09	173	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.35	1,084
97	MEDFIELD HS	1	B WING	GUIDANCE	D2	2X2 2L4' T8U 32W/NP RECESSED PARABOLIC/PRISMATIC	10	2856	60	0.60	1,714	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	10	1856.4	30	0.19	345	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.41	1,368
98	MEDFIELD HS	1	B WING	SMALL OFFICES	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	14	2856	88	1.23	3,519	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	14	1856.4	30	0.26	483	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.97	3,035
99	MEDFIELD HS	1	B WING	CONFERENCE ROOM	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	3	2856	77	0.23	660	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	3	2856	42	0.13	360			0.11	300
100	MEDFIELD HS	1	B WING	STORAGE	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	1	1000	52	0.05	52	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	1000	28	0.03	28			0.02	24
101	MEDFIELD HS	1	B WING	BREAK RROOM	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	2	2856	77	0.15	440	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	2	2856	42	0.08	240			0.07	200
102	MEDFIELD HS	1	B WING	TVP	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	6	2856	88	0.53	1,508	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	6	1856.4	30	0.11	207	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.42	1,301
103	MEDFIELD HS	1	B WING	BAND ROOM 108	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	35	2856	77	2.70	7,697	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	35	2856	42	1.47	4198			1.23	3,499
104	MEDFIELD HS	1	B WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	16	4836	52	0.83	4,024	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	16	4836	20	0.32	1548			0.51	2,476
105	MEDFIELD HS	1	B WING	BOOK STORAGE	A3	1X8 4L4' T8 32W/NP STRIP	1	1000	112	0.11	112	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	1	1000	56	0.06	56			0.06	56
106	MEDFIELD HS	1	B WING	PRACTICE 112	B2	1X4 1L4' T8 30W/LP DIRECT/INDIRECT PENDANT	2	2856	26	0.05	149	RETROFIT RPT 1L4' 14W T8 LED/BYPASS BALLAST	2	2856	14	0.03	80			0.02	69
107	MEDFIELD HS	1	B WING	ROOM 107 A, B	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	6	2856	77	0.46	1,319	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	6	2856	42	0.25	720			0.21	600
108	MEDFIELD HS	1	B WING	OFFICE 107	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	3	2856	88	0.26	754	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	3	1856.4	30	0.06	104	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.21	650

Prepared: 10/11/2016

RISE ENGINEERING

Medfield High School
88R South Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION						EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Floor	Room Number / Description	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
109	MEDFIELD HS	1	B WING	CHORUS ROOM	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	24	2856	77	1.85	5,278	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	24	2856	42	1.01	2879			0.84	2,399
110	MEDFIELD HS	1	B WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	14	4836	52	0.73	3,521	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	14	4836	20	0.28	1354			0.45	2,167
111	MEDFIELD HS	1	B WING	DRAMA	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	15	2856	88	1.32	3,770	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	15	1856.4	30	0.28	518	LRF2-OKLB-P-WH	RMJ-5T-DV-B	1.04	3,252
112	MEDFIELD HS	1	B WING	STORAGE	A3	1X8 4L4' T8 32W/NP STRIP	1	1000	112	0.11	112	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	1	1000	56	0.06	56			0.06	56
113	MEDFIELD HS	1	B WING	BATHROOM	D3	1X6 2L3' T8 25W/NP COVE VALANCE	2	2856	47	0.09	268	RETROFIT RPT 2L3' 12W T8 LED/BYPASS BALLAST	2	2856	24	0.05	137			0.05	131
114	MEDFIELD HS	1	B WING	CUSTODIAN OFFICE	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	2	4836	88	0.18	851	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	3143.4	30	0.04	117	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.14	734
115	MEDFIELD HS	1	B WING	BOILER ROOM	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	2	4836	88	0.18	851	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	4836	30	0.06	290			0.12	561
116	MEDFIELD HS	1	B WING	BOILER ROOM	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	20	4836	52	1.04	5,029	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	20	4836	28	0.56	2708			0.48	2,321
117	MEDFIELD HS	1	B WING	ELECTRICAL ROOM	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	4	1000	52	0.21	208	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	4	1000	28	0.11	112			0.10	96
118	MEDFIELD HS	1	B WING	JANITOR CLOSET	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	1	1000	52	0.05	52	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	1000	28	0.03	28			0.02	24
119	MEDFIELD HS	1	B WING	TEACHER LOUNGE	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	5	2856	77	0.39	1,100	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	5	2856	42	0.21	600			0.18	500
120	MEDFIELD HS	1	B WING	CONFERENCE ROOM	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	3	2856	77	0.23	660	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	3	2856	42	0.13	360			0.11	300
121	MEDFIELD HS	1	B WING	CORRIDOR	B1	1X4 2L4' T8 30W/LP RECESSED PARABOLIC	28	4836	52	1.46	7,041	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	28	4836	20	0.56	2708			0.90	4,333
122	MEDFIELD HS	1	B WING	ROOM 100	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	12	2856	77	0.92	2,639	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	12	2856	42	0.50	1439			0.42	1,200
123	MEDFIELD HS	1	B WING	FACULTY BATHROOM	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	2	2856	52	0.10	297	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	2856	28	0.06	160			0.05	137
124	MEDFIELD HS	1	B WING	BOOK STORAGE	A3	1X8 4L4' T8 32W/NP STRIP	2	1000	112	0.22	224	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	2	1000	56	0.11	112			0.11	112
125	MEDFIELD HS	1	B WING	HEALTH OFFICE	D2	2X2 2L4' T8U 32W/NP RECESSED PARABOLIC/PRISMATIC	4	2856	60	0.24	685	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	4	1856.4	30	0.07	138	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.17	547
126	MEDFIELD HS	1	B WING	HEALTH OFFICE	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	6	2856	88	0.53	1,508	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	6	1856.4	30	0.11	207	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.42	1,301
127	MEDFIELD HS	1	B WING	BATHROOM	D3	1X6 2L3' T8 25W/NP COVE VALANCE	2	2856	47	0.09	268	RETROFIT RPT 2L3' 12W T8 LED/BYPASS BALLAST	2	2856	24	0.05	137			0.05	131
128	MEDFIELD HS	1	B WING	STORAGE	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	1	1000	52	0.05	52	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	1000	28	0.03	28			0.02	24
129	MEDFIELD HS	1	B WING	ROOMS 101-104	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	64	2856	77	4.93	14,074	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	64	2856	42	2.69	7677			2.24	6,397
130	MEDFIELD HS	1	B WING	NEUTRALIZATION	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	2	2856	52	0.10	297	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	2856	28	0.06	160			0.05	137
131	MEDFIELD HS	1	B WING	PREP ROOMS	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	12	2856	77	0.92	2,639	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	12	2856	42	0.50	1439			0.42	1,200
132	MEDFIELD HS	1	B WING	MAIL ROOM	D2	2X2 2L4' T8U 32W/NP RECESSED PARABOLIC/PRISMATIC	9	2856	60	0.54	1,542	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	9	2856	30	0.27	771			0.27	771
133	MEDFIELD HS	1	B WING	MAIN OFFICES	C1	2X4 3L4' T8 32W/NP RECESSED PARABOLIC/PRISMATIC	16	2856	88	1.41	4,021	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	16	1856.4	30	0.30	552	LRF2-OKLB-P-WH	RMJ-5T-DV-B	1.11	3,469
134	MEDFIELD HS	1	B WING	CONFERENCE ROOM	A1	1X4 3L4' T8 30W/LP DIRECT/INDIRECT PENDANT	4	2856	77	0.31	880	RETROFIT RPT 3L4' 14W T8 LED/BYPASS BALLAST	4	2856	42	0.17	480			0.14	400
135	MEDFIELD HS	1	B WING	SAFE ROOM	A2	1X8/1X4 2L4' T8 30W/LP COVE VALANCE	1	2856	52	0.05	149	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.02	69
136	MEDFIELD HS	EXTERIOR	SOFFIT/CANOPY	CANOPY RECESSED CANS	RC1	100W METAL HALIDE REC CAN 6"	31	4380	120	3.72	16,294	NEW SYLVANIA 13W LED 6" REC CAN KIT	31	4380	13	0.40	1765			3.32	14,528
137	MEDFIELD HS	EXTERIOR	BUILDING WALL MOUNT	WALL SCONCE (UP/DOWN)	WS1	(2) 100W MH WALL SCONCE (UP/DOWN LIGHT)	10	4380	120	1.20	5,256	NEW REMPHOS 20W LED TOUGH DRUM	5	4380	20	0.10	438			1.10	4,818
138	MEDFIELD HS	EXTERIOR	BUILDING WALL MOUNT	WALL SCONCE (DOWN ONLY)	WS2	(1) 100W MH WALL SCONCE (DOWN LIGHT)	24	4380	120	2.88	12,614	NEW REMPHOS 20W LED TOUGH DRUM	24	4380	20	0.48	2102			2.40	10,512
139	MEDFIELD HS	EXTERIOR	PARKING LOTS	PARKING LOT POLES	SB1	400W MH SHOEBOX DM RND POLE BZ	39	4380	455	17.75	77,723	NEW CREE OSQ 108W LED SHOEBOX DM BZ	39	4380	109	4.25	18619			13.49	59,104
140	MEDFIELD HS	EXTERIOR	PATHWAYS	PATHWAY POLES	SB2	250W MH SHOEBOX DM RND POLE BZ	5	4380	295	1.48	6,461	NEW CREE OSQ 71W LED SHOEBOX DM BZ	5	4380	71	0.36	1555			1.12	4,906
TOTALS							**1881**			**153.48**	**534,850**		**1876**			**66.13**	**218901**			**87.35**	**315,949**

Prepared: 10/11/2016

TOTALtUBE G2® T8 BALLAST COMPATIBLE & LINE VOLTAGE | PLUG & PLAY

The RemPhos 2nd Generation TOTALtUBE G2® is now the safest, most efficient, and longest warranty LED lamp on the market. Over 140 lumens per watt. Our smart internal driver is compatible with most fluorescent ballasts or remove the ballast all-together and power directly with 120-277V AC line voltage for 7 years of maintenance free operation. Compliant with UL's new for 2016: Type A + Type B LED tube standards. First to market with our patent-pending SMARTSENSE-TLED® intelligent switching system which provides the safest possible installation that prevents any risk of electricity flowing from one end of the tube to the other before all 4 switches are pressed in. The switch also prevents against "socket to lamp pin" electrical arcing. Integrated SMARTSENSE® fused thermal protection to prevent any overheating. Light is emitted >240° through a diffused lens cover to provide both direct and indirect glare-free and completely uniform illumination (you will not see any LED spots). Backed up by RemPhos' extensive and reliable history of manufacturing. Available in 24in, 36in and 48in (normal, medium: MO or high output: HO). Check ballast for dimming compatibility. Non dimmable on line voltage.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

MANUFACTURER	MODEL NUMBER	LAMP STYLE	LENGTH	COLOR TEMPERATURE
RPT	TOTALtUBEG2	T8		
	TOTALtUBEMOG2*		24IN	3000K
	TOTALtUBEHOG2*		36IN	3500K
			48IN	4000K
			24INU	5000K

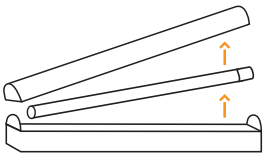
ORDERING EXAMPLE

RPT-TOTALTUBEG2-T8-48IN-4000K * 48IN only

INSTALLATION GUIDE

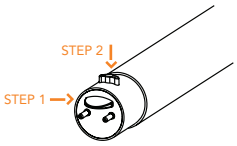
1

Turn off circuit breaker that supplies power to the fixture. Remove lens or diffusion cover on the lighting fixture. Remove existing fluorescent tube. Remove ballast if wiring LED tube to line voltage.



2

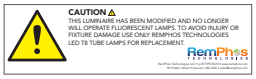
Install TOTALtUBE. If wiring to line voltage, DOUBLE ENDED power is acceptable. Shunted or Non-shunted lamp holders can be utilized.



3

Once LED tube is properly twisted into position, the SMARTSENSE®-TLED switch STEP 1 is complete. Press the SMARTSENSE-TLED® switches labeled STEP 2. Electricity will not flow through lamp until all switches are pressed in.

4



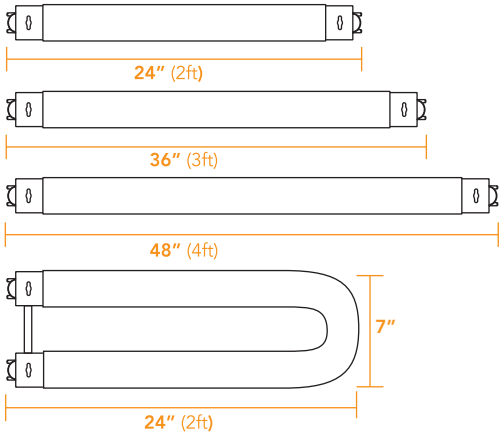
Apply Caution label to a visible spot on the fixture. Replace lens and turn on your lights!

Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC or Fluorescent Ballast
EFFICACY	140 lumens/watt
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	83+
BEAM ANGLE SPREAD	>240° provides direct and indirect
RATED LIFE	L70 LED Lifetime > 80,000 hrs
WARRANTY	7 years/60,000 hrs
CERTIFICATIONS	UL Listed as a Classified Retrofit Kit. Compliant with both Type A + Type B Standards
PERFORMANCE LISTINGS	Select models are DLC. See ordering guide.

DIMENSIONS



TOTALtUBE G2® T8 BALLAST COMPATIBLE & LINE VOLTAGE | PLUG & PLAY

ORDERING GUIDE

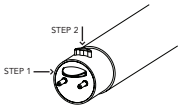
CASE QTY	ENERGY STAR	DLC	PART #	LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
25		●	RPT-TOTALTUBEG2-T8-24IN-XXXXK	1250	9	XXXX	120-277*	7	20W T8 FL	11
25			RPT-TOTALTUBEG2-T8-36IN-XXXXK	1700	12	XXXX	120-277*	7	25W T8 FL	13
25		●	RPT-TOTALTUBEG2-T8-48IN-XXXXK	1700	12	XXXX	120-277*	7	32W T8 FL	20
25		●	RPT-TOTALTUBEMOG2-T8-48IN-XXXXK	1950	14	XXXX	120-277*	7	32W T8 FL	18
25		●	RPT-TOTALTUBEHOG2-T8-48IN-XXXXK	2250	16	XXXX	120-277*	7	32W T8 FL	16
25			RPT-TOTALTUBEG2-T8-24INU-XXXXK	1700	12	XXXX	120-277*	7	40W T8 FL	28

XXXX = 3000, 3500, 4000, or 5000
* 120-277 V AC or Fluorescent ballast

WATTAGE AND LUMEN OUTPUT INFORMATION

PART #	BALLAST TYPE	BALLAST FACTOR	LAMP WATTAGE	SYSTEM WATTAGE*	LAMP LUMENS
RPT-TOTALTUBEG2-T8-24IN	Line Voltage (120-277V AC)	NA	9W	9W	1250LM
	Instant Start	Normal 0.88	9W	12.5W	1250LM
	Instant Start	Low 0.78	7.2W	9.8W	975LM
	Instant Start	High 1.18	12.4W	16.0W	1700LM
RPT-TOTALTUBEG2-T8-36IN	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM
RPT-TOTALTUBEG2-T8-48IN	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM
RPT-TOTALTUBEMOG2-T8-48IN	Line Voltage (120-277V AC)	NA	14W	14W	1950LM
	Instant Start	Normal 0.88	14W	16.9W	1950LM
	Instant Start	Low 0.78	11.2W	13.2W	1520LM
	Instant Start	High 1.18	19.3W	21.7W	2496LM
RPT-TOTALTUBEHOG2-T8-48IN	Line Voltage (120-277V AC)	NA	16W	16W	2250LM
	Instant Start	Normal 0.88	16W	18.4W	2250LM
	Instant Start	Low 0.78	12.8W	14.4W	1750LM
	Instant Start	High 1.18	22.1W	23.6W	2880LM
RPT-TOTALTUBEG2-T8-24INU	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM

* Wattage is calculated by measuring the average system wattage for a single LED tube including ballast. Average system wattage was measured at 120V and 277V with multiple ballasts from Philips, Sylvania, OSRAM, GE, Keystone, Sunpark, Howard. See table with actual test results for more detailed information on performance with specific ballasts.



The SMARTSENSE®-TLED Switch is designed to allow the LED tube to be installed into a fixture wired for double sided line voltage power. The switch ensures that no electricity is able to flow from one end of the tube to the other before all 4 switches are pressed in. Wiring the fixture to double sided line voltage power (opposed to single sided) ensures that if maintenance personnel ever attempts to reinstall a fluorescent lamp into the sockets wired for line voltage, the fluorescent lamp will simply not illuminate. There are no safety concerns.

RemPhos TECHNOLOGIES

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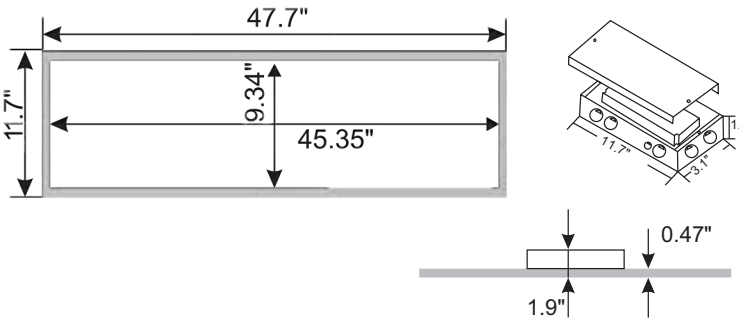
FPL1-LED SERIES

FLAT LED PANEL SERIES

1X4 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER:	
PROJECT NAME:	TYPE:



2000 LUMENS	3000 LUMENS	4000 LUMENS	5000 LUMENS
20 WATT	30 WATT	40 WATT	52 WATT

The FPL1-LED flat led panel are DLC Listed, delivers high Lumen of exceptional 80+ CRI light while achieving about 100 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature.Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling.This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 14-FPL1-LED-5000L-DIM10-MVOLT-40K

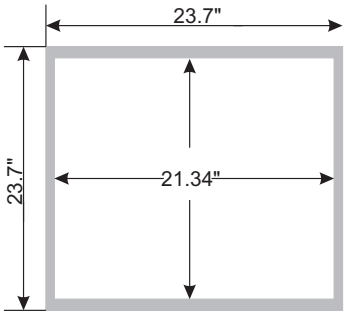
FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
14- 1' X 4'	**FPL1**-Oracle Flat LED Panel	**LED**	**2000L** - (2000 lumens) **3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**14-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

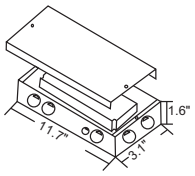
FPL1-LED SERIES

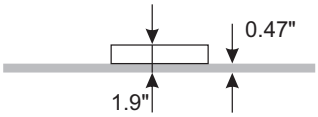
FLAT LED PANEL SERIES

2X2 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER	
PROJECT NAME:	TYPE:







2000 LUMENS	3000 LUMENS	4000 LUMENS	5000 LUMENS
20 WATT	30 WATT	40 WATT	52 WATT

The FPL1-LED flat led panel are DLC Listed,delivers high Lumen of exceptional 80+ CRI light while achieving 106 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature.Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling.This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 22-FPL1-LED-5000L-DIM10-MVOLT-40K

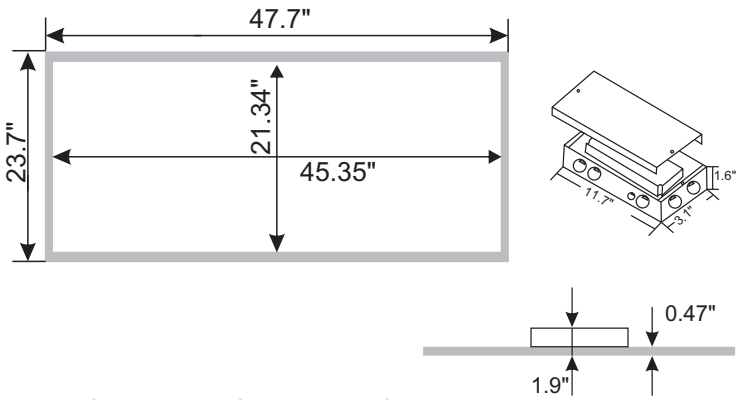
FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
22- 2' X 2'	**FPL1**-Oracle Flat LED Panel	**LED**	**2000L** - (2000 lumens) **3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**22-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

FPL1-LED SERIES

FLAT LED PANEL SERIES

2X4 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER:	
PROJECT NAME:	TYPE:



3000 LUMENS	4000 LUMENS	5000 LUMENS	6000 LUMENS
30 WATT	40 WATT	50 WATT	65 WATT

The FPL1-LED flat led panel are DLC Listed, delivers high Lumen of exceptional 80+ CRI light while achieving 98 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature. Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling. This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

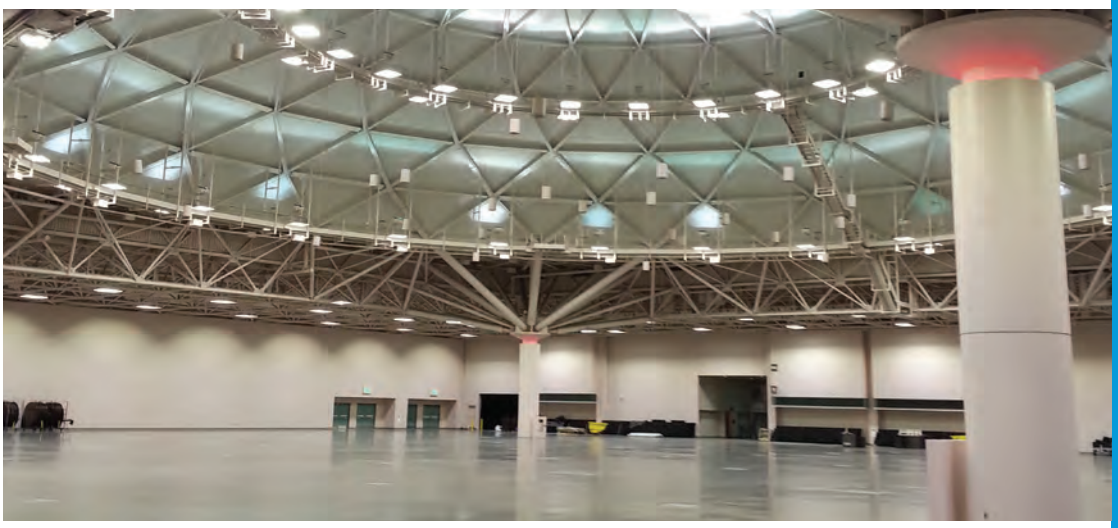
PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 24-FPL1-LED-6000L-DIM10-MVOLT-40K

FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
24 - 2' X 4'	**FPL1**-Oracle Flat LED Panel	**LED**	**3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens) **6000L** - (6000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**24-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

ESSENTIALS SERIES

The award-winning Flex Lighting Solutions Essentials family of LED fixtures provide superior optical performance, quality and versatility for low and high bay applications. With industry-leading fixture efficacy of up to 176 lm/W and up to 80% lower power consumption compared to traditional lighting, Flex Lighting Solutions' Essentials Series LED low-bays and high-bays are designed to provide you with the lowest total cost of ownership (TCO).



- » Multiple lumen options (7,000-70,000)
- » 4000K or 5000K CCT standard
- » Clear and frosted polycarbonate lenses available
- » Aisle lighter distribution available
- » Supports 120–480V inputs
- » Cable, stem or surface mounting options available
- » 95% Initial Light Output at 5 Years*
- » 85% Initial Light Output at 10 Years*
- » Ambient temperature:** -40°C (-40°F) to 55°C (131°F)
- » 5-Year standard, up to 10-year optional warranty

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
7000	6862	44	ES3P-2MS	155
	7040	51	ES3V-2MS	137
12000-14000	12119	69	ES3PE-6MS	176
	13201	98	ES3PH-2MS	135
	13521	86	ES3P-4MS	158
	13521	86	ES3P-2M	158
	14039	100	ES3V-4MS	141
	14039	100	ES3V-2M	141
17000-20000	17125	132	ES3VH-4MS	130
	17154	113	ES3PH-4MS	152
	20838	130	ES3P-6MS	161
	20880	146	ES3V-6MS	143

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
24000-28000	25031	190	ES3VU-6MS	132
	25167	184	ES3PK-4MS	137
	25918	170	ES3PU-6MS	152
	27042	171	ES3P-4M	158
	28078	200	ES3V-4M	141
35000-42000	35635	244	ES3PH-6MS	146
	40186	280	ES3PU-4M	143
	41676	259	ES3P-6M	161
	41759	293	ES3V-6M	143
48000-50000	50344	367	ES3VU-6M	137
	51835	341	ES3PU-6M	152
70000	71270	489	ES3PH-6M	146

[1] Typical at 277V (LV) and 77°F (25°C), 5000CCT, Clear Lens, +/-7%. Typical CRI80+. Frosted Lens Multiplier is .94, 4000K Multiplier is .92, Aisle Lens Multiplier is .91.

* Based on 24/7 operation. Standard models (P, V, E). H and U models may have decreased performance.

** MBR fixtures Max Temp 5°C less, typical. Max: 50°C (122°F) for ES3PH-6M, ES3PH-6MS and ES3PH-2MS. EMB fixtures 32°F to 122°F (0°C to 50°C). Temperatures below -20° have limited switch cycles, consult factory.

Ordering Example:

ES3P-A-2MS-50-WIDE-CL-LV-MBR-10V-OCCN-CORDN-EMBN

Series-Compliance-Model

ES3P-A-2MS (6862 lm, 44W)	**ES3V-A-4MS** (14039 lm, 100W)	**ES3VU-A-6MS** (25031 lm, 190W)	**ES3PU-A-4M** (40186 lm, 280W)
ES3V-A-2MS (7040 lm, 51W)	**ES3V-A-2M** (14039 lm, 100W)	**ES3PK-A-4MS** (25167 lm, 184W)	**ES3P-A-6M** (41676 lm, 259W)
ES3PE-A-6MS (12119 lm, 69W)	**ES3VH-A-4MS** (17125 lm, 132W)	**ES3PU-A-6MS** (25918 lm, 170W)	**ES3V-A-6M** (41759 lm, 293W)
ES3PH-A-2MS (13201 lm, 98W)	**ES3PH-A-4MS** (17154 lm, 113W)	**ES3P-A-4M** (27042 lm, 171W)	**ES3VU-A-6M** (50344 lm, 367W)
ES3P-A-4MS (13521 lm, 86W)	**ES3P-A-6MS** (20838 lm, 130W)	**ES3V-A-4M** (28078 lm, 200W)	**ES3PU-A-6M** (51835 lm, 341W)
ES3P-A-2M (13521 lm, 86W)	**ES3V-A-6MS** (20880 lm, 146W)	**ES3PH-A-6MS** (35635 lm, 244W)	**ES3PH-A-6M** (71270 lm, 489W)

Color Temp[1]

40
4000K

50
5000K

Other CCT Available upon request

Distribution

Wide
Wide Distribution

Aisle[10]
Aisle Distribution

Lens

CL
Clear Lens

FR
Frosted Lens

Voltage

LV
120-227V

HV
347-480V

Mounting

CRM[6]
Cable Ready (Standard) and has center opening to accept 3/4" stem

MBR[1]
Includes fixture mounting box and bracket for surface mount applications Adds 1.125" to fixture height

HOOK[1]
Field installed mounting kit, includes hook and one pair of levleing cables for hook/loop applications

MBRWT
Includes field installed MBR with factory installed balancing weight

HKWT[1]
Mounting kit including field installed hook and factory installed balancing weight

Dimming

10V
0–10V Interface (standard)

OCC Sensors

OCCN
No Sensor (standard)

OCC8[1]
Occ Sensor, on/off 8' Mounting Height

OCC20[1, 2]
Occ Sensor, on/off 20' Mounting Height

OCC40[1, 2]
Occ Sensor, on/off 40' Mounting Height

OCCDIM8[1, 4, 5]
Occ Sensor, dimmable 8' Mounting Height

OCCDIM20[1, 4, 5]
Occ Sensor, dimmable 20' Mounting Height

OCCDIM40[1, 4, 5]
Occ Sensor, dimmable 40' Mounting Height

DAINT[1, 3, 4,9]
Kit includes Daintree Wireless Fixture

DAINTR[1, 3, 4, 9]
Fixture is Factory Wired for easy integration of Daintree Wireless Controls

Cord & Plug

CORDN
No cord/plug (standard)

C6W[1, 8]
6ft cord, 15A, no plug

C15W[1,8]
15ft cord, 15A, no plug

C515[1, 8]
6ft cord, 15A, straight plug 120V (5-15P)

CL515[1,8]
6ft cord, 15A, locking plug 120V (L5-15P)

CL715[1, 8]
6ft cord, 15A, locking plug 277V (L7-15P)

CL720[1, 8]
6ft cord, 20A, locking plug 277V (L7-20P)

CL2420[1, 8]
6ft cord, 20A, locking plug 347V (L24-20P)

CL820[1,8]
6ft cord, 20A, locking plug 480V (L8-20P)

Battery Backup

EMBN
No emergency battery back-up available (standard)

EMBR[1, 4, 7, 9]
Fixture is EMB-Ready, with test button, indicator lamp and wiring harness factory installed

Option

OPTN
No Option

QDC
Driver Quick Disconnect

PROLV
Fixture installed Surge Protector 120-277V

PROHV
Fixture installed Surge Protector 347-480V

QDLV
Quick Disconnect with LV Surge Protector

QDHV
Quick Disconnect with HV Surge Protector

When submitting for utility incentives and rebates, please use part numbers. Please see our DLC Cross Reference Part Number Guide for mating the Catalog Ordering Code to the corresponding part number at www.flexlightingsolutions.com/pdf/DLC/ES3-DLC-CrossRef.pdf

[1] Optional add-on. See price list for pricing.

[2] Optional add-on for 120-277V only. High voltage options available as special order with longer lead time. Contact factory for pricing and lead time.

[3] Daintree options do not include Daintree ControlScope SoftwareTM, wireless connection hardware/infrastructures, or field commissioning. Consult Daintree for more information and ordering assistance.

[4] Optional add-on available in 120-277V only.

[5] Wireless programmer required for final field setup. See ACCESSORIES.

[6] Optional CABLEKIT ordered separately. See ACCESSORIES.

[7] Field installed EMB KIT must be ordered with this option. See ACCESSORIES.

[8] All cords are 16/3 AWG, 600V, and white.

[9] Consult factory for orders requiring DAINTR and EMBR.

[10] Aisle Lens option available in Clear only

ULTRA RT6 HO LED

Recessed Downlight Kit

RT6 HO **RT5/6**

SYLVANIA ULTRA RT6 HO is a universal input voltage 5" and 6" compatible LED recessed downlight kit that creates high performing white light and is optimized for new construction and retrofit applications utilizing pin based compact fluorescent lamps. Installation is done quickly and easily in most standard six-inch frames.

The RT6 HO downlight is offered in 900 lumen and 1500 lumen options and achieves up to 71 lumens per watt.

The RT6 HO is designed to deliver light output comparable to traditional 1x18W, 1x26W and 2x26W pin based compact fluorescent luminaires.

Key Features & Benefits

- 120-277 universal input voltage
- Lumen package:
  - 900 lumens @ 13 watts (0-10V Dimmable)
  - 1500 lumens @ 21 watts (Not dimmable)
- Replacement for 18W, 26W and 32W CFL pin based lamps
- Fits in standard 5" and 6" CFL mounting frame
- CCT: 2700K, 3000K, 3500K & 4000K
- CRI of >80
- 50,000 hour life (L_{70})
- Suitable for dry, damp and wet locations
- UL1598 Listed and Classified for stand-alone and retrofit applications
- Reduces energy consumption up to 34%
- Lasts up to 4 times longer than compact fluorescent lamps
- No warm-up time, instant-on with full light output and stable lamp to lamp color
- Integrated white trim and metal conduit adaptor (included) for direct replacement

Product Offering

Ordering Abbreviation	Wattage	CCT
LED/RT5/6/HO/900	13	2700K, 3000K, 3500K, 4000K
LED/RT6/HO/1500	21	3000K, 3500K, 4000K

Application Information

Application Notes

1. Operating temperature range between -4°F and +104°F (-20°C and +40°C).
2. Suitable for use in indoor dry, damp and wet location commercial application environments.
3. Compatible with Philips Bodine ELI-S-20 Emergency Lighting Micro Inverter.
4. Designed to install in standard 6" CFL mounting frame. For a list of compatible housings, please refer to www.sylvania.com/RT6.
5. For detailed warranty information, please see www.sylvania.com/RT6.
6. RT6/HO 1500 lumen is not intended for use in dimming applications.
7. The RT5/6 HO 900 lumen is compatible with Leviton 0-10V dimmer model IP710-DL.
8. For installation in non-insulated ceilings: If insulation is present, it may be placed around the retrofit kit as long as a three-inch space is maintained around the kit.
9. Installation performed as a stand-alone kit (without frame) is recommended for hard ceiling. Installation of a recessed incandescent frame (such as Lightolier model 1102P1) is recommended for tiled ceiling application for proper support of the retrofit kit.

Specifications and Certifications

Specification Data

Catalog #	Type
Project	
Comments	
Prepared by	

Specifications

Energy Data

Minimum Starting Temp: -20°C (-4°F)

EMI/RFI: RT6/HO 1500 lumen: FCC Title 47 CFR, Part 15, Class B
RT6/HO 900 lumen: FCC Title 47 CFR, Part 15, Class A

Sound Rating: <24dBA

Input Voltage: 120-277V

Power Factor: >0.90

Input Frequency: 60Hz

THD: <20%

Input Power: 13W & 21W

Input Current: 0.15A @ 120V; 0.07A @ 277V

Maximum Ambient Operating Temperature (Non-Insulated Ceiling): 40°C (104°F)

Lighting Data

Lumen Output: 900 and 1500

Lumens per Watt: 71

Color

Correlated Color Temperature (CCT): 2700K, 3000K, 3500K, 4000K

Color Rendering Index (CRI): >80

Product weight: 1.6lb

Ordering Information

Item Number	Ordering Abbreviation	Recessed Housing	Replaced CFL Wattage	Nominal Wattage (W)	Delivered Light Output (lm)	Color Temperature	Avg. Rated Life (hrs)*	Packaging Configuration	Dimmable
75137	RT5/6/HO/900/827	5" and 6"	18W	13	900	2700K	50,000	4/case	YES
75138	RT5/6/HO/900/830	5" and 6"	18W	13	900	3000K	50,000	4/case	YES
75140	RT5/6/HO/900/835	5" and 6"	18W	13	900	3500K	50,000	4/case	YES
75139	RT5/6/HO/900/840	5" and 6"	18W	13	900	4000K	50,000	4/case	YES
72487	LED/RT6/1500/HO/830	6"	26W & 32W	21	1500	3000K	50,000	4/case	NO
72494	LED/RT6/1500/HO/835	6"	26W & 32W	21	1500	3500K	50,000	4/case	NO
72495	LED/RT6/1500/HO/840	6"	26W & 32W	21	1500	4000K	50,000	4/case	NO

* LED lamp life is defined as the number of hours when 50% of an average group of identical lamps reached 70% of its initial lumens.

Ordering Guide

LED	/	RT6	/	1500	/	HO	/	8	30
LED		Product Name RT6 5/6 = fits 5" and 6" frames 6 = fits 6" frames		Light Output 1500lm 900lm		High Outout		CRI >80	Color Temperature 2700K, 3000K, 3500K, 4000K

Energy Savings

Basic Product Description	LED Lumens	LED Life	Traditional Lamp Types	Lumens	Life	Watts Saved With RT6	RT6 Energy Savings*	RT6 Life Benefit
RT5/6 HO 13W	900	50,000	18W CFL DD, DT	1200	16,000	5	$27	3X
RT6/HO 21W	1500	50,000	26W CFL DD, DT	1800	16,000	5	$27	3X
RT6/HO 21W	1500	50,000	32W CFL DD, DT	2400	16,000	11	$60	3X

* Based on $0.11/kWh over 50,000 hours life.

Accessories

RT5/6 Retrofit Trim

75095	RT/5/6/TRIM/DKBZ
75097	RT/5/6/TRIM/BLK
75098	RT/5/6/TRIM/ORBZ

75097 75098

TOUGHDRUM®

DURABLE AND BEAUTIFUL LED FIXTURE | POWERED BY OUR LEDCR®

Don't let its good looks fool you. Same rugged quality as the outdoor drum, with beautiful black anodized trim. The fixture is designed to safely and quickly replace any existing incandescent or fluorescent fixture. Includes all of the mounting hardware and electrical connections required. Optional integrated occupancy sensor dims fixture to low energy mode when space is unoccupied.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

MANUFACTURER	MODEL NUMBER	SIZE	LUMENS	COLOR TEMP	OPTIONS
RPT	TOUGHDRUM	13IN			
			1600LM	3000K*	OCC HI/LO VARIABLE OCCUPANCY SENSOR
			2200LM	4000K	10VDIM 0-10V DIMMABLE
					EMG EMERGENCY BATTERY BACKUP
					120 LVD TRIAC/PHASE DIMMABLE
					277 LVD TRIAC/PHASE DIMMABLE

ORDERING EXAMPLE

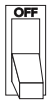
RPT-TOUGHDRUM-13IN-1600LM-3000K-OCC

* 3000K part number can be used for 3000-3500K

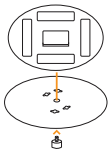
LEDCR LIGHT ENGINE

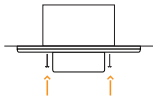
The ToughDrum is powered by our patented, infield replacable and upgradable light engine. See LEDCR cut sheet for more information.

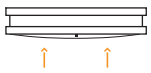
INSTALLATION GUIDE

1. 

Turn off power to the fixture.

2. 
Make connections & using provided brass nut, tighten LEDCR plate onto fixture.

3. 
Install LEDCR/fixture base assembly to existing junction box using longer provided screws.

4. 
Install fixture lens, turn on power.

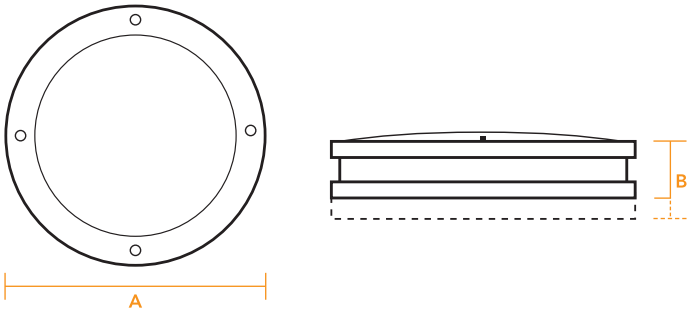
Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC
EFFICACY	>120 LPW @ 4000K
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	85+
WARRANTY	5 years
CERTIFICATIONS	
PERFORMANCE LISTINGS	

May be protected under the following US patents
US 8,106569 | US 8,882,298 | Additional patents pending.

DIMENSIONS



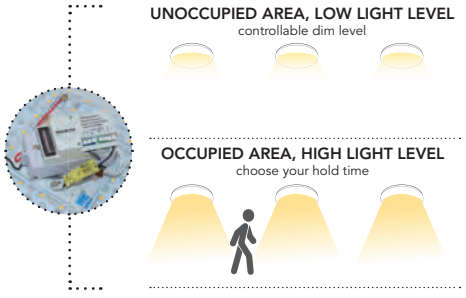
DIMENSIONS (INCHES)	A	B
RPT-TOUGHDRUM-13IN (without optional EMG)	13	3.75
RPT-TOUGHDRUM-13IN (with optional EMG)	13	5.25

TOUGHDRUM® DURABLE AND BEAUTIFUL LED FIXTURE | POWERED BY OUR LEDCR®

ORDERING GUIDE

QUICK SHIP	DLC E*	PART #	LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
	E*	RPT-TOUGHDRUM-13IN-1600LM-3000K	1350	12	3000	120-277	5	3 x 13W CFL (45W)	33
	E*	RPT-TOUGHDRUM-13IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
	DLC E*	RPT-TOUGHDRUM-13IN-1600LM-3000K-OCC	1350	14hi/3lo	3000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
	DLC E*	RPT-TOUGHDRUM-13IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
	E*	RPT-TOUGHDRUM-13IN-2200LM-3000K	1900	18	3000	120-277	5	2 x 26W CFL (54W)	36
	E*	RPT-TOUGHDRUM-13IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
	DLC E*	RPT-TOUGHDRUM-13IN-2200LM-3000K-OCC	1900	20hi/4lo	3000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
	DLC E*	RPT-TOUGHDRUM-13IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo

OPTIONAL FACTORY INSTALLED OCC SENSOR



The LEDCR can be paired with our integral occupancy sensor for maximum energy savings. Unlike traditional passive infrared or ultrasonic occupancy sensors, this high-frequency sensor can be hidden behind the lens of an existing fixture, eliminating the need for external sensors and providing a clean look.

OPTIONAL FACTORY INSTALLED EMG BACKUP

The LEDCR can be paired with an Emergency battery backup. Provides over 90 minutes of safe light levels when power goes out. Battery backup is installed in fixture housing without the need for increasing fixture height.

OPTIONAL TRIM COLORS AND COLLAR

The ToughDrum® housing metal trim can be custom powder coated to virtually color. Also stand-off collar can be provided for mounting of fixture to hard surfaces. Contact us for details.

RemPhos TECHNOLOGIES

RemPhos Technologies LLC • p 877.997.3674 • www.remphos.com
90 Holten Street • Danvers, MA USA • sales@remphos.com

OSQ Series

OSQ™ LED Area/Flood Luminaire – Medium

Product Description

The OSQ™ Area/Flood luminaire blends extreme optical control, advanced thermal management and modern, clean aesthetics. Built to last, the housing is rugged cast aluminum with an integral, weathertight LED driver compartment. Versatile mounting configurations offer simple installation. Its slim, low-profile design minimizes wind load requirements and blends seamlessly into the site providing even, quality illumination. 'A' and 'B' Input power designators are a suitable upgrade for HID applications up to 250 Watt. 'J' and 'K' Input power designators are a suitable upgrade for HID applications up to 400 Watt.

Applications: Parking lots, walkways, campuses, car dealerships, office complexes, and internal roadways

Performance Summary

NanoOptic® Precision Delivery Grid™ optic

Made in the U.S.A. of U.S. and imported parts

Initial Delivered Lumens: Up to 17,191

Efficacy: Up to 136 LPW

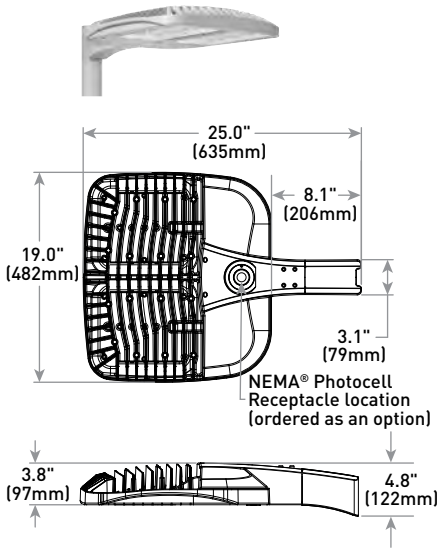
CRI: Minimum 70 CRI (4000K & 5700K; 3000K asymmetric optics); 80 CRI (3000K symmetric optics)

CCT: 3000K (+/- 300K), 4000K (+/- 300K), 5700K (+/- 500K)

Limited Warranty†: 10 years on luminaire/10 years on Colorfast DeltaGuard® finish

†See http://lighting.cree.com/warranty for warranty terms

DA Mount



Weight
26.5 lbs. (12kg)

Accessories

Field-Installed	
Backlight Shield OSQ-BLSMF – Front facing optics OSQ-BLSMR – Rotated optics	**Hand-Held Remote** XA-SENSREM - For successful implementation of the programmable multi-level option, a minimum of one hand-held remote is required

Ordering Information

Fully assembled luminaire is composed of two components that must be ordered separately:
Example: **Mount:** OSQ-AASV + **Luminaire:** OSQ-A-NM-2ME-A-40K-UL-SV

Mount (Luminaire must be ordered separately)			
OSQ-			
OSQ-AA Adjustable Arm **OSQ-DA** Direct Arm	**Color Options:**	**SV** Silver **BK** Black	**BZ** Bronze **WH** White

Luminaire (Mount must be ordered separately)

OSQ	A	NM						
Product	**Version**	**Mounting**	**Optic**	**Input Power Designator**	**CCT**	**Voltage**	**Color Options**	**Options**
OSQ	A	**NM** No Mount	**Asymmetric** **2ME*** Type II Medium **4ME*** Type IV Medium **3ME*** Type III Medium **Symmetric** **5ME** Type V Medium **5SH** Type V Short **WSN** Wide Sign **15D** 15° Flood **25D** 25° Flood **40D** 40° Flood **60D** 60° Flood	**A** 112W **J** 168W **B** 86W **K** 130W	**30K** 3000K **40K** 4000K **57K** 5700K	**UL** Universal 120-277V **UH** Universal 347-480V	**BK** Black **BZ** Bronze **SV** Silver **WH** White	**DIM** 0-10V Dimming - Control by others - Refer to Dimming spec sheet for details - Can't exceed wattage of specified input power designator **F** Fuse - When code dictates fusing, use time delay fuse **ML** Multi-Level - Refer to ML spec sheet for details - High: 100%, Low: 30% - Available with UL voltage only - Intended for downlight applications at 0° tilt **PML** Programmable Multi-Level, 20-40' Mounting Height - Refer to PML spec sheet for details - Available with UL voltage only - Intended for downlight applications at 0° tilt **PML2** Programmable Multi-Level, 10-30' Mounting Height - Refer to PML spec sheet for details - Available with UL voltage only - Intended for downlight applications at 0° tilt **Q9** Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details **R** NEMA® Photocell Receptacle - Intended for downlight applications with maximum 45° tilt - 3-pin receptacle per ANSI C136.10 - Photocell and shorting cap by others **RL** Rotate Left - LED and optic are rotated to the left **RR** Rotate Right - LED and optic are rotated to the right

* Available with Backlight Shield when ordered with field-installed accessory (see table above)

Rev. Date: V8 05/23/2016

US: lighting.cree.com/lighting T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Product Specifications

CONSTRUCTION & MATERIALS

- Slim, low profile design minimizes wind load requirements
- Luminaire housing is rugged die cast aluminum with an integral, weathertight LED driver compartment and high performance heat sink
- Convenient interlocking mounting method on direct arm mount. Mounting adaptor is rugged die cast aluminum and mounts to 3-6" (76-152mm) square or round pole, secured by two 5/16-18 UNC bolts spaced on 2" (51mm) centers
- Mounting for the adjustable arm mount adaptor is rugged die cast aluminum and mounts to 2" (51mm) IP, 2.375" (60mm) O.D. tenon
- Adjustable arm mount can be adjusted 180˚ in 2.5˚ increments
- Designed for uplight and downlight applications
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Silver, bronze, black, and white are available
- **Weight:** 26.5 lbs. (12kg)

ELECTRICAL SYSTEM

- **Input Voltage:** 120-277V or 347-480V, 50/60Hz, Class 1 drivers
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used
- **10V Source Current:** 0.15mA

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- Suitable for wet locations
- Enclosure rated IP66 per IEC 60529 when ordered without R option
- Consult factory for CE Certified products
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets FCC Part 15 , Subpart B, Class A standards for conducted and radiated emissions
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA
- DLC qualified when ordered with asymmetric optics with 40K or 57K. Please refer to www.designlights.org/QPL for most current information
- RoHS compliant. Consult factory for additional details

Electrical Data*

Input Power Designator	Optic	System Watts 120-480V	Total Current					
			120V	208V	240V	277V	347V	480V
A	Asymmetric	112	0.97	0.56	0.49	0.43	0.34	0.25
J		168	1.47	0.85	0.74	0.64	0.50	0.36
B	Symmetric	86	0.73	0.43	0.37	0.32	0.25	0.19
K		130	1.09	0.65	0.56	0.49	0.38	0.28

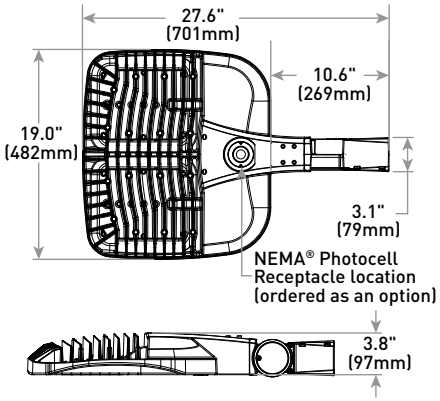
* Electrical data at 25˚C (77˚F). Actual wattage may differ by +/- 10% when operating between 120-480V +/-10%

Recommended OSQ Series Lumen Maintenance Factors (LMF)[1]

Ambient	Optic	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Projected[2] LMF	100K hr Calculated[3] LMF
5˚C (41˚F)	Asymmetric	1.04	0.99	0.93	0.89	0.84
	Symmetric	1.05	1.00	0.96[3]	0.92[3]	0.88[3]
10˚C (50˚F)	Asymmetric	1.03	0.98	0.93	0.88	0.83
	Symmetric	1.04	0.99	0.95[3]	0.91[3]	0.87[3]
15˚C (59˚F)	Asymmetric	1.02	0.97	0.92	0.87	0.82
	Symmetric	1.02	0.98	0.94[3]	0.90[3]	0.87[3]
20˚C (68˚F)	Asymmetric	1.01	0.96	0.91	0.86	0.82
	Symmetric	1.01	0.96	0.92[3]	0.88[3]	0.85[3]
25˚C (77˚F)	Asymmetric	1.00	0.95	0.90	0.85	0.81
	Symmetric	1.00	0.95	0.91[3]	0.88[3]	0.84[3]

[1] Lumen maintenance values at 25˚C (77˚F) are calculated per TM-21 based on LM-80 data and in-situ luminaire testing
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT] i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT] i.e. the packaged LED chip)

AA Mount



Weight
26.5 lbs. (12kg)

Appendix A6

Columbia Gas of Massachusetts

A NiSource Company

Energy Assessment

Prepared For:

Medfield High School

88R South St., Medfield, MA 02052

Prepared By: Sam Nutter

Director Gas Program Services

RISE Engineering

SNutter@RiseEngineering.com

(401) 784 – 3700 ext. 6184

RISE ENGINEERING

Overview

Columbia Gas of Massachusetts has retained RISE Engineering to evaluate the energy consumption and potential energy efficiency measures for their commercial and industrial customers, including municipal customers. The purpose of this review is to summarize existing energy usage patterns, to highlight any issues with regard to elevated energy consumption, and to determine if there are cost-effective measures that can be implemented by the customer. Energy efficiency measures will decrease the energy consumption and may provide a favorable payback to the customer. If the recommended measures are installed or implemented, incentives may be available from Columbia Gas of Massachusetts and/or from Eversource Energy.

The savings and cost estimates in this report are engineering estimates that are based upon accepted industry practices. These are estimates, not savings guarantees or installation quotations. Prior to moving to installation or construction, additional testing, measurement, or verification may be required to further refine the savings estimates. Additionally, firm quotations for the requested scope of work should also be obtained prior to making final project selections.

Finally, the utility incentives shown in this report are estimates that may change from year to year or if the final scope of work is changed from the described scope herein. Incentive levels must be confirmed by the applicable utility prior to the commencement of construction or implementation of the recommended measures.

Facility / Project Information

Medfield High School, 88R South Street, Medfield, MA 02052

Site Contact: Michael LaFrancesca (mlafrancesca@email.medfield.net)
Columbia Gas Contact: Ernie Robinson (erobinson@nisource.com) (508) 580-0100 ext. 1357
Eversource Contact: Steve Grattan (Steven.Grattan@eversource.com) 781-441-8243

Energy Usage (past 12 months):	Natural Gas: 65,740 therms
	Electricity: 1,380,950 kWh
Total Conditioned Space:	186,487 sq.ft. (per Medfield Tax Assessor database)
Heating Use index:	0.35 therms/ft^2/yr. (35 kBtu/ft^2/yr.)
Energy Use Intensity (EUI) index:	60.4 kBtu/ft^2/yr.

Benchmarking

According to the U.S. Department of Energy's Commercial Reference Buildings nationwide benchmark data, secondary schools in this climate zone have an average EUI of 88 kBtu/ft^2/yr. EUI includes all energy use in the building. Therefore Medfield High School is about 31% more energy efficient than its peer high schools in similar climate zones. For the heating energy portion, secondary school buildings in similar climate zones typically have a Heating Use index in the range of 0.54 therms/ft^2/yr., or about 54 kBtu/ft^2/yr. The lower heating index value for the Medfield High School indicates this building is below the average range for similar buildings which shows that the building is rather efficient in its current state. Nonetheless, the energy assessment indicates that there are opportunities for additional improvements as described in the following sections.

Summary Table of Energy Efficiency Opportunities

Medfield High School						10/21/2016
Measure Description	Estimated Cost	Annual Therm Savings	Annual kWh Savings	Annual Energy $ Savings	Total Estimated Incentive	Estimated Net Cost
EMS retrocommissioning	TBD	2,959	13,917	$5,225	TBD	TBD
Showerheads	$700	530		$610	$700	$0
Faucet Aerators	$265	408		$469	$265	$0
Spray Valve	$150	114		$131	$150	$0
Interior Lighting 1st Floor	$98,180		107,857	$17,796	$26,964	$71,216
Interior Lighting 2nd Floor	$95,402		114,224	$18,847	$28,556	$66,846
Exterior Lighting	$47,951		93,868	$15,488	$23,467	$24,484

Facility Overview

This building was completely renovated starting in about 2003. There was also a large addition added at that time. All new mechanical (HVAC) equipment, lighting, and related energy consuming systems were installed during the addition/renovation process. Therefore, the building systems are only about 10 - 12 years old

The HVAC mechanical equipment includes:

- A Trane Tracer Summit V14 energy management system (EMS) was installed during the addition/renovation.
- A Trane CO_2 monitoring and control system was installed in July 2009 with sensors in classroom and other areas.
- Primary heating is provided by 3 cast iron sectional hot water boilers with natural gas fired power flame burners
- Heating water loop is glycol treated & has a VFD on the pump and a 3-way valve to reset loop temp based on outside air temperature
- Additionally, there are 23 packaged rooftop units (RTUs) that provide supplemental (gas) heat and cooling
- 55 unit ventilators are primarily located in the classrooms
- 10 air handling units (AHUs) primarily serve the lower level (basement) locker room areas and the new office wing
- There is a heat recovery (heat wheel) system on the gymnasium make up air system

The existing lighting is mostly T-8 lamps with electronic ballasts. There are also high output T-5 lamps in the gymnasium and some LED retrofits have been done in limited areas such as the cafeteria and some hallway downlight fixtures. RISE Engineering completed a full room-by-room lighting audit on 10/4/16. The detailed results and recommendations from that lighting audit were presented in a separate report.

Energy Efficiency Opportunities

Retro-commissioning to the EMS. Although the Trane Tracer Summit EMS system was installed relatively recently, it has not been fully maintained to provide optimal performance. The current facilities staff were not part of the original commissioning and training process 10 +/- years ago and therefore do not know how to maximize operation of the system to achieve highest efficiency. Finally, due to improvements in technology over the past 10-12 years, the front-end interface for the system is rather outdated and difficult to access and operate. Therefore, it is highly recommended that Medfield perform a comprehensive retro-commissioning of the EMS system that includes a thorough and well documented training program for all the key facilities staff and managers.

A thorough retro-commissioning will include identifying the full extent of existing deficiencies, developing an action plan to remedy those deficiencies, implementing the approved repairs or upgrades, and subsequently training the end users on optimal system operation. The cost of the retro-commissioning services will need to be established via a bidding process.

Since identifying the full extent of existing deficiencies is beyond the scope of an energy assessment, the savings shown in this report are a conservative estimate based upon regaining better control of schedules and temperatures. During the retro-commissioning process, additional savings opportunities will likely be identified.

Utility incentives for retro-commissioning are evaluated on a case by case basis, therefore any applicable incentive would be established as the project moves forward. These are often done on a performance basis and paid after the savings estimates have been proven over time.

Upgrades to the EMS

An EMS commissioning project was undertaken at the school and completed in April 2006. The 2006 Commissioning Report documented several types of deficiencies or design shortcomings in the EMS. The retro-commissioning process will determine if those opportunities still exist, and if additional problems have arisen in the past 10 years. If correcting those shortcomings involves adding "points" to the EMS in order to better monitor and/or control HVAC systems, such upgrades are likely to be eligible for prescriptive EMS incentives. Another upgrade that is recommended would be a new front-end interface. Currently, an EMS system operator must sit in a facilities office at a desktop computer – there is no ability to monitor or control the system remotely. Modern EMS controls can be accessed remotely via computers, tablets, or even cellphones which provides much better access for facilities managers and staff.

Low Flow Showerheads

The showerheads in the locker rooms should be upgraded with low-flow showerheads rated at 1.5 GPM. These save hot water which saves natural gas for heating the water. The cost savings in this report are based on the natural gas cost savings only. However, each low flow showerhead is estimated to also save over 7,000 gallons of water per year. Columbia Gas typically fully subsidizes this measure (pays 100% of the installed cost) for the stock low flow showerheads if installed by RISE staff, or will typically pay up to 50% of the cost for custom or premium showerheads.

Low Flow Faucet Aerators

The faucet aerators in the rest rooms and locker rooms should be upgraded with low-flow aerators rated at 1.5 GPM, or less. These save hot water, and natural gas as well. The cost savings in this report are based on the natural gas cost savings only. However, each low flow aerator is estimated to also save over 5,000 gallons of water per year. Columbia Gas typically pays 100% of the cost of this measure if RISE staff installs the low flow aerators.

High Performance Spray Valves

Spray valves are used in commercial kitchens, such as those found in school cafeterias, to pre-rinse items before they go through the dishwasher. High performance spray valves that use less hot water are available through the MassSave program. Columbia Gas typically fully subsidizes these when installed by RISE staff. The efficient spray valves can be installed at the same time as the aerators and showerheads.

Energy Efficient Commercial Food Service Equipment

Although not detailed in this report, it was reported during the site visit that the school's cafeteria equipment is nearing the end of life and may need to be replaced. Both Columbia Gas and Eversource offer prescriptive incentives for high efficiency commercial kitchen equipment. The rebates range from $100 to as high as $2,000 for equipment such as high efficiency ovens, Energy Star steamers, commercial dishwashers, ice machines, or hot food holding cabinets. Rebate forms can be downloaded from the Mass Save website: http://www.masssave.com/en/business/eligible-equipment/food-service

Summary and Next Steps

Any prescriptive measures presented here, such as showerheads, aerators, or spray valves have established savings, costs, and incentive levels and can proceed to implementation at any time. Similarly, the lighting measures proposed by RISE (see separate reports) have had the savings, costs, and incentives established and confirmed by the utility program administrators and can proceed to construction at any time.

As noted previously, any custom gas efficiency measures, such as upgrades or retro-commissioning of an EMS system, will need further analysis and vetting with the applicable utility program administrators before proceeding to construction. The prices for such custom measures should be confirmed shortly before any planned installations as the costs shown in this report are engineering estimates and are subject to change over time.

RISE Engineering

RISE Engineering, a division of Thielsch Engineering, Inc. ("RISE"), prepared this energy assessment on behalf of Columbia Gas of Massachusetts, and the MassSave energy efficiency programs. RISE has provided services to natural gas and electric utilities and their customers since 1997. RISE maintains a full time dedicated staff at appropriate levels to meet the needs of the Massachusetts energy efficiency programs and to complete energy efficiency projects for end user customers. RISE provides services throughout New England and New York from our central office in Cranston, RI, as well as from local offices in Canton, MA and South Yarmouth, MA. RISE services include: energy assessments, energy engineering, direct installations of efficiency measures, project management of custom projects, and turn-key installation services including HVAC, weatherization, and electrical measures.

Appendix A7

Columbia Gas of Massachusetts

A NiSource Company

Energy Assessment

Prepared For:

Medfield Public Library

468 Main Street, Medfield, MA 02052

Prepared By: Sam Nutter

Director Gas Program Services

RISE Engineering

SNutter@RiseEngineering.com

(401) 784 – 3700 ext. 6184

RISE ENGINEERING

Overview

Columbia Gas of Massachusetts has retained RISE Engineering to evaluate the energy consumption and potential energy efficiency measures for their commercial and industrial customers, including municipal customers. The purpose of this review is to summarize existing energy usage patterns, to highlight any issues with regard to elevated energy consumption, and to determine if there are cost-effective measures that can be implemented by the customer. Energy efficiency measures will decrease the energy consumption and may provide a favorable payback to the customer. If the recommended measures are installed or implemented, incentives may be available from Columbia Gas of Massachusetts and/or from Eversource Energy.

The savings and cost estimates in this report are engineering estimates that are based upon accepted industry practices. These are estimates, not savings guarantees or installation quotations. Prior to moving to installation or construction, additional testing, measurement, or verification may be required to further refine the savings estimates. Additionally, firm quotations for the requested scope of work should also be obtained prior to making final project selections.

Finally, the utility incentives shown in this report are estimates that may change from year to year or if the final scope of work is changed from the described scope herein. Incentive levels must be confirmed by the applicable utility prior to the commencement of construction or implementation of the recommended measures.

Facility / Project Information

Medfield Public Library, 24 Pound Street, Medfield, MA 02052

Site Contact: Michael Sullivan (msullivan@medfield.net)
Columbia Gas Contact: Ernie Robinson (erobinson@nisource.com) (508) 580-0100 ext. 1357
Eversource Contact: Steve Grattan (Steven.Grattan@eversource.com) 781-441-8243

Energy Usage (past 12 months):	Natural Gas: 4,644 therms
	Electricity: 112,640 kWh
Total Conditioned Space:	22,192 sq.ft. (per Medfield Tax Assessor database)
Heating Use index:	0.21 therms/ft^2/yr. (21 kBtu/ft^2/yr.)
Energy Use Intensity (EUI) index:	38.3 kBtu/ft^2/yr.

Benchmarking

According to the U.S. Energy Information Administration's Commercial Buildings Energy Consumption Survey (CBECS), public assembly buildings nationwide have an average EUI of 86.3 kBtu/ft2/yr. CBECS data is not particularly granular for this building type and includes a variety of other public assembly building types in a variety of climates. Nonetheless, an EUI of 38.3 is relatively good and indicates a reasonably efficient baseline building. Nonetheless, there are some opportunities for efficiency improvements as described in the following sections.

Summary Table of Energy Efficiency Opportunities

Medfield Public Library						10/21/2016
Measure Description	Estimated Cost	Annual Therm Savings	Annual kWh Savings	Annual Energy $ Savings	Total Estimated Incentive	Estimated Net Cost
EMS	$50,000	213	2,605	$685	$9,600	$40,400
Pipe Insulation	$600	46		$53	$300	$300
Attic Air Sealing	$3,500	381	521	$485	$1,750	$1,750
Attic Insulation	$2,500	56	47	$76	$0	$2,500

Medfield Public Library						10/19/2016
Measure Description	Estimated Cost	Annual Therm Savings	Annual kWh Savings	Annual Energy $ Savings	Total Estimated Incentive	Estimated Net Cost
EMS	$75,000	213	2,605	$685	$9,600	$65,400
Pipe Insulation	$600	46		$53	$300	$300
Attic Air Sealing	$3,500	381	521	$485	$1,750	$1,750
Attic Insulation	$2,500	86	73	$101	$1,250	$1,250

Facility Overview

This original library building was constructed in 1917 and underwent a major addition/renovation in 1998. The original building is a single level of about 2,500 sq. ft. with very high ceilings (approximately 18'), whereas the addition is comprised of three levels that total about 19,600 sq. ft. The entire building is heated and air conditioned.

The HVAC mechanical equipment includes:

- Primary heating is provided by a high efficiency, condensing Lochinvar hot water boiler rated at 399 MBH input that was installed about three years ago.
- There is heating baseboard (fin tube) on multiple zones throughout the building perimeter
- 8 packaged RTUs are located on the roof of the addition and provide supplemental (gas) heat and (electric) cooling
- Individual thermostats control the various zones. Typically there are two thermostats per zone: 1 for the baseboard heat; and 1 for the RTU. The RTUs are controlled by relatively new Ecobee wi-fi thermostats but the baseboard zones have old Honeywell analog clock thermostats
- DHW is provided from a 50 gallon electric water heater.

The existing linear lighting is a mixture of T-8 lamps with electronic ballasts, and LED T-8 retrofit tubes in the fixtures that have longer run hours. There are also numerous recessed downlights that have had the compact fluorescent bulbs replaced with LED retrofits. Most of the remaining linear and downlight fixtures are expected to be retrofit by the maintenance staff and most of the materials to complete this are already in the re-lamping inventory in the attic area. There may be an opportunity for a custom lighting project in high ceiling areas of the original building as will be detailed later in this report.

Energy Efficiency Opportunities

Energy Management System.

The current system of individual thermostats is difficult to maintain and it is not possible to monitor the building remotely. Furthermore, there are typically two thermostats per zone (1 for heat; 1 for cooling) which allows the possibility of an unfortunate situation in which one thermostat could be calling for heat simultaneously while the other is calling for cooling. An energy management system (EMS) would prevent such occurrences, would allow more precise and coordinated scheduling of the systems to align with the Library operation schedule, and could allow remote monitoring by the Town Manager or other staff from remote locations. Since identifying the full extent of existing deficiencies and specifying a complete EMS is beyond the scope of this energy assessment, the cost and savings shown in this report are a conservative estimate based upon regaining better control of schedules and temperatures. During the final design and bidding process, additional savings opportunities may be identified, and an actual specification and cost quotation will be developed. The incentive level for the EMS shown in this report assumes a ~~prescriptive~~ Prescriptive rebate application, as it did not pass the Custom cost effectiveness test, and is based upon an assumed ~~number of~~32 points.

Upgrades to the Thermostats

If the EMS project described above is not undertaken, a lower cost option could be to replace the old analog clock thermostats on the heating zones with Ecobee wi-fi thermostats similar to those on the heating/cooling zones. Although this would not be a true EMS, all of the HVAC would be controlled by the same type of system. Additionally, since these are wi-fi thermostats, they could be controlled remotely. Wi-fi thermostats can generally be installed for $300 - $400 each and are typically eligible for an incentive of approximately 50% of the cost from Columbia Gas.

Pipe Insulation

The high efficiency Lochinvar boiler was installed about 3 years ago after the previous boiler failed. It is a high efficiency boiler, but when the contractor installed it, they did not insulate the new copper piping in the immediate area near the boiler. This recommendation is to insulate the copper pipe and fittings in the boiler room. Columbia Gas typically subsidizes up to 50% of the cost for this custom measure.

Attic Air Sealing

The attic above the original Library is insulated. However, there are numerous penetrations through the ceiling for light fixures, electrical wiring, or similar penetrations for plumbing vents, etc. These penetrations, combined with small cracks and voids above walls or at the wall-to-ceiling junctions, allow large amounts of conditioned (heated or cooled) air to escape into the attic. Air sealing fills these voids with foam insulation and/or with sheetrock boxes around the light fixtures to dramatically reduce this unwanted air flow. Columbia Gas typically subsidizes up to 50% of the cost for this custom measure.

Add Attic Insulation

The attic above the original Library is a large open and accessible area that is insulated to approximately R-30. However, current recommendations for this climate specify attic insulation up to R-49. This recommendation would add about 5" of insulation on top of the existing insulation. This should be done after the Air Sealing is completed. This measure did not pass the Custom cost effectiveness test however and therefore is not eligible for a ~~Colu~~Columbia Gas ~~typically subsidizes up to 50% of the cost for this custom measure~~incentive.

Custom Lighting Opportunity

There may be an additional opportunity for a custom lighting project in high ceiling areas of the original library building. These areas have 9 large decorative pendant light fixtures that have direct (towards the floor) and indirect (reflects off the ceiling) lighting elements. The indirect upwards oriented lights are 400 watt metal halide lamps with the ballasts mounted remotely in the attic. The downlight elements have four fluorescent lamps per fixture that are believed to be 26 or 32 watts each. This is a potential opportunity to convert to LED lighting. However, this is a historical area so the fixtures would need to either be retrofitted, or new fixtures of similar appearance would need to be specified, and there is a. Due to the requirement to specify Design Lights Consortium approved lighting fixtures in order to qualify for an incentive. Due to this is a challenging design requirement and the time constraints and high visibility, historical nature of this applto submit this reportication, further investigation will need to occur at a later date. Eversource would most likely provide an incentive for this element (amount TBD). However, if the Attic Air Sealing and Insulation are to move forward, it would be recommended to complete this lighting project first.

Summary and Next Steps

Many of the measures presented here, such as pipe insulation, attic air sealing, or attic insulation, have well established savings, costs, and incentive levels and can proceed to implementation at any time. The only additional step would be a final scoping visit by the crew chief prior to ordering or scheduling the work.

The EMS recommendation at the Library will need further analysis and design. Once the analysis, cost proposals, and vetting with the applicable utility program administrators has been completed, Medfield can make the final decisions before proceeding to construction. The suggested Custom lighting project would also need similar analyses, design, cost proposals, and vetting with Eversource before proceeding.

RISE Engineering

RISE Engineering, a division of Thielsch Engineering, Inc. (“RISE”), prepared this energy assessment on behalf of Columbia Gas of Massachusetts, and the MassSave energy efficiency programs. RISE has provided services to natural gas and electric utilities and their customers since 1997. RISE maintains a full time dedicated staff at appropriate levels to meet the needs of the Massachusetts energy efficiency programs and to complete energy efficiency projects for end user customers. RISE provides services throughout New England and New York from our central office in Cranston, RI, as well as from local offices in Canton, MA and South Yarmouth, MA. RISE services include: energy assessments, energy engineering, direct installations of efficiency measures, project management of custom projects, and turn-key installation services including HVAC, weatherization, and electrical measures.

Appendix A8

RISE ENGINEERING™
Division of Thielsch Engineering, Inc
1341 Elmwood Avenue
Cranston, Rhode Island 02910

EVERSOURCE

Memorial Elementary School LED Lighting Upgrades

LED TUBES/BYPASS BALLASTS, LED RECESSED FLAT PANELS & EXTERIOR LED

Financial Summary

Total Project Cost	**$**	**130,992**
Estimated Electric Incentive	**$**	**(36,113)**
Customer Net Cost	**$**	**94,879**
Estimated Energy Cost Savings Annually	**$**	**23,834**
Estimated Maintenance Savings	**$**	**3,456**
Return on Investment (ROI)		**29%**
Simple Payback in Years		**3.5**

Energy Savings

kW Reduction	kWh Reduction
38.55	**144,451**

Pollution Savings

CO2 Reduction (lbs)	NOx Reduction (lbs)	SO2 Reduction (lbs)
183,020	**155.0**	**572.7**

Prepared: 10/11/2016

RISE ENGINEERING

Memorial Elementary School
59 Adams Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
1	MEMORIAL ELEM	EXIT DOOR 9	RC1	2L32W CFL RECESSED CAN 8"	2	4380	68	0.14	596	NEW SYLVANIA 27W LED 8" REC CAN KIT	2	4380	27	0.05	237			0.08	359
2	MEMORIAL ELEM	CLASSROOMS 1-8	B1	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	160	2856	60	9.60	27,418	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	160	2856	28	4.48	12795			5.12	14,623
3	MEMORIAL ELEM	CLASSROOMS 1-8 BATHROOMS	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	8	2856	60	0.48	1,371	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	8	2856	28	0.22	640			0.26	731
4	MEMORIAL ELEM	CORRIDOR	RC1	2L32W CFL RECESSED CAN 8"	16	4836	68	1.09	5,262	NEW SYLVANIA 27W LED 8" REC CAN KIT	16	4836	27	0.43	2089			0.66	3,172
5	MEMORIAL ELEM	CORRIDOR	B3	1X4 2L4' T8 32W/NP RECESSED PRISMATIC	23	4836	60	1.38	6,674	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	23	4836	20	0.46	2225			0.92	4,449
6	MEMORIAL ELEM	RESTROOMS	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	5	2856	60	0.30	857	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	5	2856	28	0.14	400			0.16	457
7	MEMORIAL ELEM	MDF	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	2	2856	63	0.13	360	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.09	291
8	MEMORIAL ELEM	STORAGE 1 & 3	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	2	1000	60	0.12	120	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	1000	28	0.06	56			0.06	64
9	MEMORIAL ELEM	MEDIA CENTER	RC1	2L32W CFL RECESSED CAN 8"	13	2856	68	0.88	2,525	NEW SYLVANIA 27W LED 8" REC CAN KIT	13	2856	27	0.35	1002			0.53	1,522
10	MEMORIAL ELEM	MEDIA CENTER	P1	CHANDELEIR 3L2' F40 BIAX	13	2856	102	1.33	3,787	RETROFIT RPT 3L2' 20W T8 LED BIAX/BYPASS BALLAST	13	2856	60	0.78	2228			0.55	1,559
11	MEMORIAL ELEM	STORAGE	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	2	1000	63	0.13	126	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1000	30	0.06	60			0.07	66
12	MEMORIAL ELEM	OFFICE	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	2	2856	63	0.13	360	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.09	291
13	MEMORIAL ELEM	CORRIDOR	B3	1X4 2L4' T8 32W/NP RECESSED PRISMATIC	16	4836	60	0.96	4,643	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	16	4836	20	0.32	1548			0.64	3,095
14	MEMORIAL ELEM	BATHROOM	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	2	2856	60	0.12	343	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	2856	28	0.06	160			0.06	183
15	MEMORIAL ELEM	MRS FLAHERTY TEACHER PLANNING	D1	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	6	2856	53	0.32	908	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	6	1856.4	30	0.11	207	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.21	701
16	MEMORIAL ELEM	MRS FLAHERTY TEACHER PLANNING	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	2	2856	63	0.13	360	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.09	291
17	MEMORIAL ELEM	ELECTRIC ROOM	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	1	1000	60	0.06	60	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	1000	28	0.03	28			0.03	32
18	MEMORIAL ELEM	MUSIC/ART	B1	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	20	2856	60	1.20	3,427	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	20	2856	28	0.56	1599			0.64	1,828
19	MEMORIAL ELEM	OFICE KILN	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	4	2856	63	0.25	720	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	1856.4	30	0.07	138	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.18	582
20	MEMORIAL ELEM	ELECTRIC/ MECHANICAL ROOM	A1	1X8 4L4' T8 32W/NP INDUSTRIAL	10	1000	112	1.12	1,120	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	10	1000	56	0.56	560			0.56	560
21	MEMORIAL ELEM	CUSTODIAN OFFICE	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	1	2856	63	0.06	180	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	1856.4	30	0.02	35	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.04	145
22	MEMORIAL ELEM	CLASSROOM 9	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	4	2856	63	0.25	720	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	1856.4	30	0.07	138	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.18	582
23	MEMORIAL ELEM	CLASSROOM 9	D1	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	1	2856	53	0.05	151	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	1	1856.4	30	0.02	35	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.03	117
24	MEMORIAL ELEM	IDF	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
25	MEMORIAL ELEM	LOBBY	RC1	2L32W CFL RECESSED CAN 8"	13	4836	68	0.88	4,275	NEW SYLVANIA 27W LED 8" REC CAN KIT	13	4836	27	0.35	1697			0.53	2,578
26	MEMORIAL ELEM	GYM	G1	1X4 3L4' T5HO 54W/PSEB HIF GYM	12	4836	177	2.12	10,272	NEW LUSIO 4MS 88W LED LOWBAY OCC40	12	4836	88	1.06	5107			1.07	5,165
27	MEMORIAL ELEM	OFFICE	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	2	2856	63	0.13	360	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1856.4	30	0.04	69	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.09	291
28	MEMORIAL ELEM	STORAGE	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	2	1000	60	0.12	120	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	1000	28	0.06	56			0.06	64
29	MEMORIAL ELEM	CORRIDOR 11-20	RC1	2L32W CFL RECESSED CAN 8"	12	4836	68	0.82	3,946	NEW SYLVANIA 27W LED 8" REC CAN KIT	12	4836	27	0.32	1567			0.49	2,379
30	MEMORIAL ELEM	CORRIDOR	B3	1X4 2L4' T8 32W/NP RECESSED PRISMATIC	19	4836	60	1.14	5,513	NEW ORACLE 1X4 20W LED RECESSED FLAT PANEL	19	4836	20	0.38	1838			0.76	3,675
31	MEMORIAL ELEM	CLASSROOMS 10-15	B1	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	96	2856	60	5.76	16,451	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	96	2856	28	2.69	7677			3.07	8,774
32	MEMORIAL ELEM	CLASSROOMS 17, 19-22	D1	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	30	2856	53	1.59	4,541	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	30	1856.4	30	0.56	1036	LRF2-OKLB-P-WH	RMJ-5T-DV-B	1.03	3,505

Prepared: 10/11/2016

RISE ENGINEERING

Memorial Elementary School
59 Adams Street
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ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						SENSOR DETAIL		ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	Sensor Model #	Power Pack Model #	kW Saved	kWh Saved
33	MEMORIAL ELEM	CLASSROOMS 16, 18	B1	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	20	2856	60	1.20	3,427	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	20	2856	28	0.56	1599			0.64	1,828
34	MEMORIAL ELEM	RESTROOMS/CUSTODIAN	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	7	2856	60	0.42	1,200	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	7	2856	28	0.20	560			0.22	640
35	MEMORIAL ELEM	CORRIDOR 23-28	B1	1X4 2L4' T8 32W/NP DIRECT/INDIRECT PENDANT	96	4836	60	5.76	27,855	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	96	4836	28	2.69	12999			3.07	14,856
36	MEMORIAL ELEM	RESTROOMS/CUSTODIAN	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	7	2856	60	0.42	1,200	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	7	2856	28	0.20	560			0.22	640
37	MEMORIAL ELEM	IDF	A1	1X8 4L4' T8 32W/NP INDUSTRIAL	1	2856	112	0.11	320	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	1	2856	56	0.06	160			0.06	160
38	MEMORIAL ELEM	TEACHER PLANNING	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	4	2856	63	0.25	720	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	4	1856.4	30	0.07	138	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.18	582
39	MEMORIAL ELEM	BATHROOM	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
40	MEMORIAL ELEM	STORAGE 4/2	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	4	1000	60	0.24	240	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	4	1000	28	0.11	112			0.13	128
41	MEMORIAL ELEM	CAFETERIA	RC1	2L32W CFL RECESSED CAN 8"	3	2856	68	0.20	583	NEW SYLVANIA 27W LED 8" REC CAN KIT	3	2856	27	0.08	231			0.12	351
42	MEMORIAL ELEM	CAFETERIA	G2	1X4 3L4' T5HO 54W/PSEB RECESSED PRISMATIC CAFÉ	9	2856	177	1.59	4,550	NEW ORACLE 2X4 50W LED RECESSED FLAT PANEL	9	2856	50	0.45	1285			1.14	3,264
43	MEMORIAL ELEM	KITCHEN	D2	2X2 2L4' T8U 32W/NP RECESSED PRISMATIC	18	2856	60	1.08	3,084	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	18	2856	30	0.54	1542			0.54	1,542
44	MEMORIAL ELEM	OFFICE	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	1	2856	63	0.06	180	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	1856.4	30	0.02	35	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.04	145
45	MEMORIAL ELEM	STORAGE	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	2	1000	63	0.13	126	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	2	1000	30	0.06	60			0.07	66
46	MEMORIAL ELEM	BATHROOM	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
47	MEMORIAL ELEM	ELECTRIC ROOM	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	2	1000	60	0.12	120	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	1000	28	0.06	56			0.06	64
48	MEMORIAL ELEM	TEACHER DINING	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	6	2856	63	0.38	1,080	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	6	1856.4	30	0.11	207	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.27	872
49	MEMORIAL ELEM	TEACHER DINING	D1	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	4	2856	53	0.21	605	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	4	1856.4	30	0.07	138	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.14	467
50	MEMORIAL ELEM	BATHROOM	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	2	2856	60	0.12	343	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	2	2856	28	0.06	160			0.06	183
51	MEMORIAL ELEM	HEALTH OPEN AREA	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	3	2856	63	0.19	540	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	3	1856.4	30	0.06	104	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.13	436
52	MEMORIAL ELEM	HEALTH OPEN AREA	D1	2X2 3L2' T8 17W/NP RECESSED PARABOLIC	3	2856	53	0.16	454	NEW ORACLE 2X2 30W LED RECESSED FLAT PANEL	3	1856.4	30	0.06	104	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.10	351
53	MEMORIAL ELEM	STORAGE	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	1	1000	63	0.06	63	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	1000	30	0.03	30			0.03	33
54	MEMORIAL ELEM	BATHROOM	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	1	2856	60	0.06	171	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	2856	28	0.03	80			0.03	91
55	MEMORIAL ELEM	OFFICE	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	1	2856	63	0.06	180	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	1	1856.4	30	0.02	35	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.04	145
56	MEMORIAL ELEM	REAR OFFICE STORAGE	B2	1X4 2L4' T8 32W/NP VANITY/INDUSTRIAL	1	1000	60	0.06	60	RETROFIT RPT 2L4' 14W T8 LED/BYPASS BALLAST	1	1000	28	0.03	28			0.03	32
57	MEMORIAL ELEM	REAR OFFICE	C1	2X4 3L4' T8 28W/LP RECESSED PARABOLIC/PRISMATIC	14	2856	63	0.88	2,519	NEW ORACLE 2X4 30W LED RECESSED FLAT PANEL	14	1856.4	30	0.26	483	LRF2-OKLB-P-WH	RMJ-5T-DV-B	0.62	2,036
58	MEMORIAL ELEM	EXTERIOR ENTRANCE	RC2	100W MH RECESSED CAN 8"	6	4380	120	0.72	3,154	NEW SYLVANIA 27W LED 8" REC CAN KIT	6	4380	27	0.16	710			0.56	2,444
59	MEMORIAL ELEM	EXTERIOR WALL SCONCES	WS1	100W MH WALL SCONCE	12	4380	120	1.44	6,307	NEW REMPHOS 20W LED TOUGH DRUM	12	4380	20	0.24	1051			1.20	5,256
60	MEMORIAL ELEM	EXTERIOR PARKING LOT POLES	SB1	400W MH SHOEBOX DM RND POLE BZ	20	4380	455	9.10	39,858	NEW CREE OSQ 108W LED SHOEBOX DM BZ	20	4380	109	2.18	9548			6.92	30,310
61	MEMORIAL ELEM	EXTERIOR ENTRANCE 10	RC2	100W MH RECESSED CAN 8"	1	4380	120	0.12	526	NEW SYLVANIA 27W LED 8" REC CAN KIT	1	4380	27	0.03	118			0.09	407
62	MEMORIAL ELEM	EXTERIOR PATHWAY POLES	SB2	250W MH SHOEBOX DM RND POLE BZ	15	4380	295	4.43	19,382	NEW CREE OSQ 71W LED SHOEBOX DM BZ	15	4380	71	1.07	4665			3.36	14,717
		TOTALS			**768**			**62.54**	**226,921**		**768**			**23.99**	**82470**			**38.55**	**144,451**

Prepared: 10/11/2016

TOTALtUBE G2® T8 BALLAST COMPATIBLE & LINE VOLTAGE | PLUG & PLAY

The RemPhos 2nd Generation TOTALtUBE G2® is now the safest, most efficient, and longest warranty LED lamp on the market. Over 140 lumens per watt. Our smart internal driver is compatible with most fluorescent ballasts or remove the ballast all-together and power directly with 120-277V AC line voltage for 7 years of maintenance free operation. Compliant with UL's new for 2016: Type A + Type B LED tube standards. First to market with our patent-pending SMARTSENSE-TLED® intelligent switching system which provides the safest possible installation that prevents any risk of electricity flowing from one end of the tube to the other before all 4 switches are pressed in. The switch also prevents against "socket to lamp pin" electrical arcing. Integrated SMARTSENSE® fused thermal protection to prevent any overheating. Light is emitted >240° through a diffused lens cover to provide both direct and indirect glare-free and completely uniform illumination (you will not see any LED spots). Backed up by RemPhos' extensive and reliable history of manufacturing. Available in 24in, 36in and 48in (normal, medium: MO or high output: HO). Check ballast for dimming compatibility. Non dimmable on line voltage.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

MANUFACTURER	MODEL NUMBER	LAMP STYLE	LENGTH	COLOR TEMPERATURE
RPT	TOTALtUBEG2	T8		
	TOTALtUBEMOG2*		24IN	3000K
	TOTALtUBEHOG2*		36IN	3500K
			48IN	4000K
			24INU	5000K

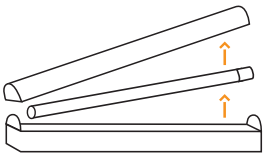
ORDERING EXAMPLE

RPT-TOTALTUBEG2-T8-48IN-4000K * 48IN only

INSTALLATION GUIDE

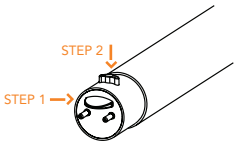
1

Turn off circuit breaker that supplies power to the fixture. Remove lens or diffusion cover on the lighting fixture. Remove existing fluorescent tube. Remove ballast if wiring LED tube to line voltage.



2

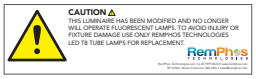
Install TOTALtUBE. If wiring to line voltage, DOUBLE ENDED power is acceptable. Shunted or Non-shunted lamp holders can be utilized.



3

Once LED tube is properly twisted into position, the SMARTSENSE®-TLED switch STEP 1 is complete. Press the SMARTSENSE-TLED® switches labeled STEP 2. Electricity will not flow through lamp until all switches are pressed in.

4



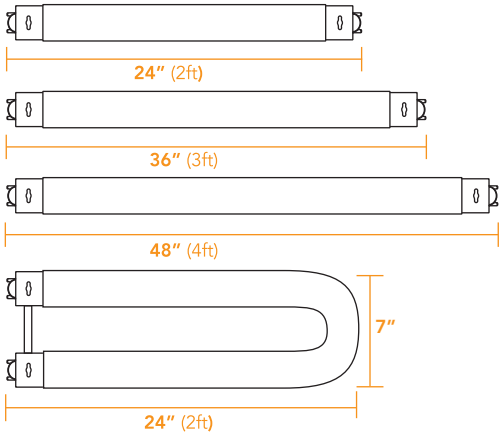
Apply Caution label to a visible spot on the fixture. Replace lens and turn on your lights!

Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC or Fluorescent Ballast
EFFICACY	140 lumens/watt
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	83+
BEAM ANGLE SPREAD	>240° provides direct and indirect
RATED LIFE	L70 LED Lifetime > 80,000 hrs
WARRANTY	7 years/60,000 hrs
CERTIFICATIONS	UL Listed as a Classified Retrofit Kit. Compliant with both Type A + Type B Standards
PERFORMANCE LISTINGS	Select models are DLC. See ordering guide.

DIMENSIONS



TOTALtUBE G2® T8 BALLAST COMPATIBLE & LINE VOLTAGE | PLUG & PLAY

ORDERING GUIDE

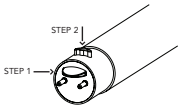
CASE QTY	ENERGY STAR	DLC	PART #	LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
25		●	RPT-TOTALTUBEG2-T8-24IN-XXXXK	1250	9	XXXX	120-277*	7	20W T8 FL	11
25			RPT-TOTALTUBEG2-T8-36IN-XXXXK	1700	12	XXXX	120-277*	7	25W T8 FL	13
25		●	RPT-TOTALTUBEG2-T8-48IN-XXXXK	1700	12	XXXX	120-277*	7	32W T8 FL	20
25		●	RPT-TOTALTUBEMOG2-T8-48IN-XXXXK	1950	14	XXXX	120-277*	7	32W T8 FL	18
25		●	RPT-TOTALTUBEHOG2-T8-48IN-XXXXK	2250	16	XXXX	120-277*	7	32W T8 FL	16
25			RPT-TOTALTUBEG2-T8-24INU-XXXXK	1700	12	XXXX	120-277*	7	40W T8 FL	28

XXXX = 3000, 3500, 4000, or 5000
* 120-277 V AC or Fluorescent ballast

WATTAGE AND LUMEN OUTPUT INFORMATION

PART #	BALLAST TYPE	BALLAST FACTOR	LAMP WATTAGE	SYSTEM WATTAGE*	LAMP LUMENS
RPT-TOTALTUBEG2-T8-24IN	Line Voltage (120-277V AC)	NA	9W	9W	1250LM
	Instant Start	Normal 0.88	9W	12.5W	1250LM
	Instant Start	Low 0.78	7.2W	9.8W	975LM
	Instant Start	High 1.18	12.4W	16.0W	1700LM
RPT-TOTALTUBEG2-T8-36IN	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM
RPT-TOTALTUBEG2-T8-48IN	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM
RPT-TOTALTUBEMOG2-T8-48IN	Line Voltage (120-277V AC)	NA	14W	14W	1950LM
	Instant Start	Normal 0.88	14W	16.9W	1950LM
	Instant Start	Low 0.78	11.2W	13.2W	1520LM
	Instant Start	High 1.18	19.3W	21.7W	2496LM
RPT-TOTALTUBEHOG2-T8-48IN	Line Voltage (120-277V AC)	NA	16W	16W	2250LM
	Instant Start	Normal 0.88	16W	18.4W	2250LM
	Instant Start	Low 0.78	12.8W	14.4W	1750LM
	Instant Start	High 1.18	22.1W	23.6W	2880LM
RPT-TOTALTUBEG2-T8-24INU	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM

* Wattage is calculated by measuring the average system wattage for a single LED tube including ballast. Average system wattage was measured at 120V and 277V with multiple ballasts from Philips, Sylvania, OSRAM, GE, Keystone, Sunpark, Howard. See table with actual test results for more detailed information on performance with specific ballasts.



The SMARTSENSE®-TLED Switch is designed to allow the LED tube to be installed into a fixture wired for double sided line voltage power. The switch ensures that no electricity is able to flow from one end of the tube to the other before all 4 switches are pressed in. Wiring the fixture to double sided line voltage power (opposed to single sided) ensures that if maintenance personnel ever attempts to reinstall a fluorescent lamp into the sockets wired for line voltage, the fluorescent lamp will simply not illuminate. There are no safety concerns.

RemPhos TECHNOLOGIES

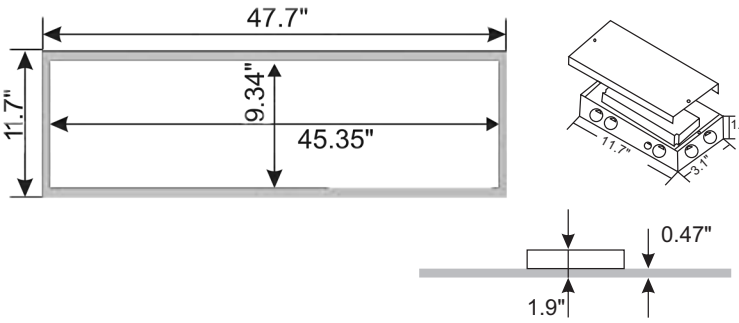
RemPhos Technologies LLC • p 877.997.3674 • www.remphos.com
90 Holten Street • Danvers, MA USA • sales@remphos.com

FPL1-LED SERIES

FLAT LED PANEL SERIES

1X4 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER:	
PROJECT NAME:	TYPE:



2000 LUMENS	3000 LUMENS	4000 LUMENS	5000 LUMENS
20 WATT	30 WATT	40 WATT	52 WATT

The FPL1-LED flat led panel are DLC Listed, delivers high Lumen of exceptional 80+ CRI light while achieving about 100 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature.Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling.This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 14-FPL1-LED-5000L-DIM10-MVOLT-40K

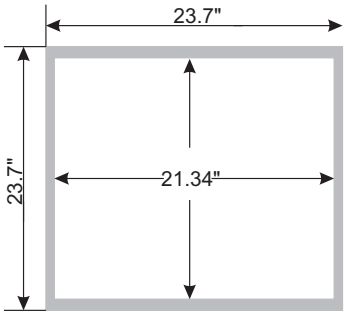
FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
14- 1' X 4'	**FPL1**-Oracle Flat LED Panel	**LED**	**2000L** - (2000 lumens) **3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**14-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

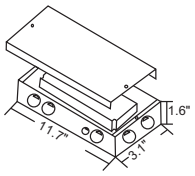
FPL1-LED SERIES

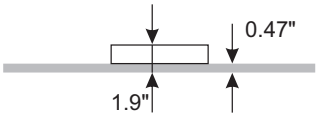
FLAT LED PANEL SERIES

2X2 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER	
PROJECT NAME:	TYPE:







2000 LUMENS	3000 LUMENS	4000 LUMENS	5000 LUMENS
20 WATT	30 WATT	40 WATT	52 WATT

The FPL1-LED flat led panel are DLC Listed,delivers high Lumen of exceptional 80+ CRI light while achieving 106 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature.Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling.This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 22-FPL1-LED-5000L-DIM10-MVOLT-40K

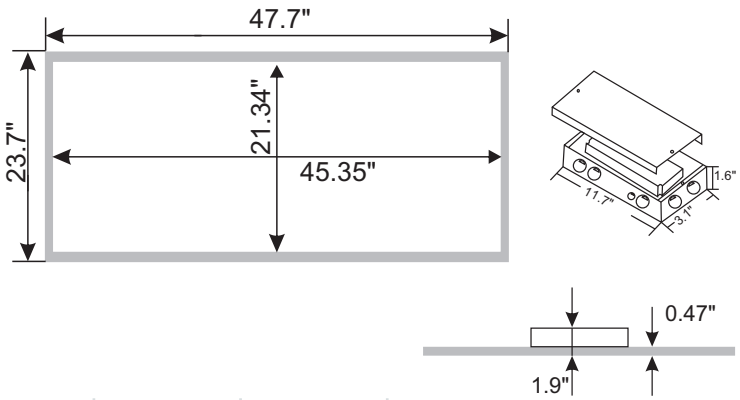
FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
22- 2' X 2'	**FPL1**-Oracle Flat LED Panel	**LED**	**2000L** - (2000 lumens) **3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**22-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

FPL1-LED SERIES

FLAT LED PANEL SERIES

2X4 ARCHITECTURAL
PREMIUM FLAT LED PANEL

CATALOG NUMBER:	
PROJECT NAME:	TYPE:



3000 LUMENS	4000 LUMENS	5000 LUMENS	6000 LUMENS
30 WATT	40 WATT	50 WATT	65 WATT

The FPL1-LED flat led panel are DLC Listed, delivers high Lumen of exceptional 80+ CRI light while achieving 98 lumens per watt. It is available in 4000k,5000k DLC CCT options and has 0-10V dimming, which is perfect for new construction applications or retrofitting existing fluorescent troffer fixtures with recessed installation,widely used in office spaces, major retail stores, education,government, healthcare, and hospitality.

LED CHIP -Use approved LM-80 SMD packing,Active color management maintains superior color consistency over time and temperature. Every fixture is tuned as a complete system to the optimal color point before shipment,ensuring fixture-to-fixture color consistency.

HEAT SINK - The source and radiator distribution in fixture around, heat source distribution placed solve heat concentration, quantity of heat conduction of each other and radiation, effective to solve thermal management system design of the cooling. This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

OPTICAL SYSTEM - Proprietary optical system utilizes a unique combination of reflective and refractive optical components to achieve a uniform, comfortable appearance. Use guide plate laser high density pixels to shine, and has the light even, high lum maintenance, shiny surface, no shelter Angle, and no glare, high efficacy.

THERMAL MANAGEMENT - LED light engines are attached directly to the housing which keeps the engines cool. Our advanced thermal management system allows the light output of the LED engines to be maintained at 70% of initial lumens at 83,000 hours of operation.

DIMMING - The FPL1-LED comes standard with 0-10V dimming on either 120 or 277V. Dimmable down to 1% of initial lumens. Also available in Lutron dimming options. Consult factory for dimmer compatibility.

ELECTRICAL - Powered by high-quality constant-current power LED drivers which are rated for 50 to 60Hz at 120-277V input, produce less than 20% THD, and have a power factor of .90 to 1.00.

MAINTENANCE - LED engines and driver can be accessed through the bottom by removing hinged door frame and driver box cover. LED engines are removable and upgradable even after fixture installation. Fixture can be regularly and safely wiped down to ensure optimal fixture performance.

OPTIONS - Fixtures can be shipped pre-installed with daylight harvesting controls, occupancy sensors, and/or power pack. Available manufacturer options include Leviton, Wattstopper, Hubbell Automation, and others.

QUALITY CONTROL - Every fixture is turned on and rigorously tested by our QC Department before shipping.

LISTING - UL/C-UL listed to US and Canadian standards

WARRANTY - Limited 5 Year Warranty

SAMEDAY SHIPPING
(On selected configuration, consult factory)

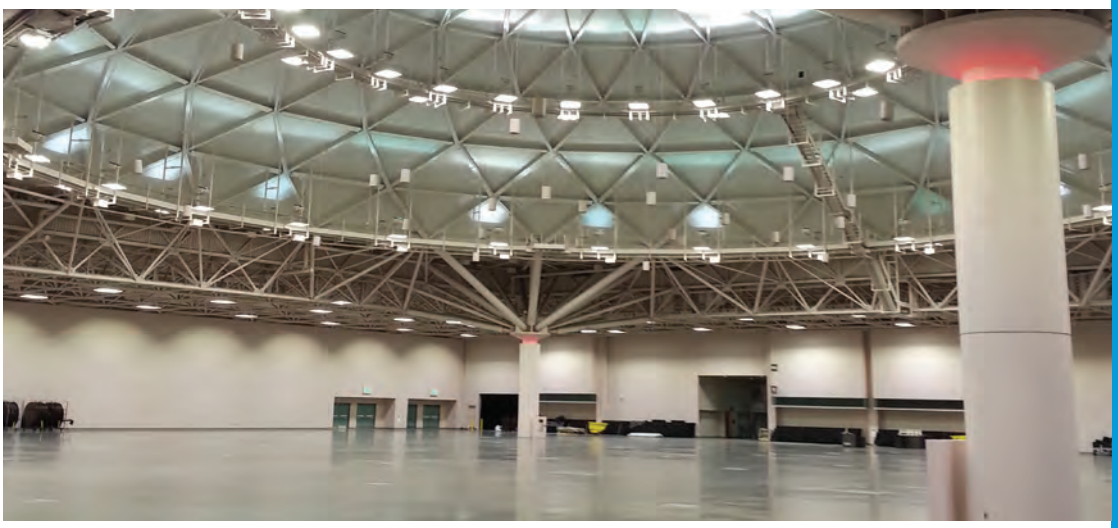
PROUDLY ASSEMBLED in AMERICA

Ordering Information: Example: 24-FPL1-LED-6000L-DIM10-MVOLT-40K

FIXTURE SIZE	SERIES	TYPE	LUMENS	DIMMING	VOLTAGE	CCT	EMERGENCY	OPTIONS
24 - 2' X 4'	**FPL1**-Oracle Flat LED Panel	**LED**	**3000L** - (3000 lumens) **4000L** - (4000 lumens) **5000L** - (5000 lumens) **6000L** - (6000 lumens)	**DIM10** - 0-10V Dimming **LUTH** - Lutron Dimming **DIMST** - Step Dimming	**MVOLT** **347*** * Consult factory for details	**30K** - (3000K) **35K** - (3500K) **40K** - (4000K) **50K** - (5000K)	**EMG-LED**	**24-SMK** - Surface Mount Kit **LMFC-011** - Digital Ligting Manager **FS-PPV2** - Fixture Sensor Power Pack

ESSENTIALS SERIES

The award-winning Flex Lighting Solutions Essentials family of LED fixtures provide superior optical performance, quality and versatility for low and high bay applications. With industry-leading fixture efficacy of up to 176 lm/W and up to 80% lower power consumption compared to traditional lighting, Flex Lighting Solutions' Essentials Series LED low-bays and high-bays are designed to provide you with the lowest total cost of ownership (TCO).



- » Multiple lumen options (7,000-70,000)
- » 4000K or 5000K CCT standard
- » Clear and frosted polycarbonate lenses available
- » Aisle lighter distribution available
- » Supports 120–480V inputs
- » Cable, stem or surface mounting options available
- » 95% Initial Light Output at 5 Years*
- » 85% Initial Light Output at 10 Years*
- » Ambient temperature:** -40°C (-40°F) to 55°C (131°F)
- » 5-Year standard, up to 10-year optional warranty

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
7000	6862	44	ES3P-2MS	155
	7040	51	ES3V-2MS	137
12000-14000	12119	69	ES3PE-6MS	176
	13201	98	ES3PH-2MS	135
	13521	86	ES3P-4MS	158
	13521	86	ES3P-2M	158
	14039	100	ES3V-4MS	141
	14039	100	ES3V-2M	141
17000-20000	17125	132	ES3VH-4MS	130
	17154	113	ES3PH-4MS	152
	20838	130	ES3P-6MS	161
	20880	146	ES3V-6MS	143

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
24000-28000	25031	190	ES3VU-6MS	132
	25167	184	ES3PK-4MS	137
	25918	170	ES3PU-6MS	152
	27042	171	ES3P-4M	158
	28078	200	ES3V-4M	141
35000-42000	35635	244	ES3PH-6MS	146
	40186	280	ES3PU-4M	143
	41676	259	ES3P-6M	161
	41759	293	ES3V-6M	143
48000-50000	50344	367	ES3VU-6M	137
	51835	341	ES3PU-6M	152
70000	71270	489	ES3PH-6M	146

[1] Typical at 277V (LV) and 77°F (25°C), 5000CCT, Clear Lens, +/-7%. Typical CRI80+. Frosted Lens Multiplier is .94, 4000K Multiplier is .92, Aisle Lens Multiplier is .91.

* Based on 24/7 operation. Standard models (P, V, E). H and U models may have decreased performance.

** MBR fixtures Max Temp 5°C less, typical. Max: 50°C (122°F) for ES3PH-6M, ES3PH-6MS and ES3PH-2MS. EMB fixtures 32°F to 122°F (0°C to 50°C). Temperatures below -20° have limited switch cycles, consult factory.

Ordering Example:

ES3P-A-2MS-50-WIDE-CL-LV-MBR-10V-OCCN-CORDN-EMBN

Series-Compliance-Model

ES3P-A-2MS (6862 lm, 44W)	**ES3V-A-4MS** (14039 lm, 100W)	**ES3VU-A-6MS** (25031 lm, 190W)	**ES3PU-A-4M** (40186 lm, 280W)
ES3V-A-2MS (7040 lm, 51W)	**ES3V-A-2M** (14039 lm, 100W)	**ES3PK-A-4MS** (25167 lm, 184W)	**ES3P-A-6M** (41676 lm, 259W)
ES3PE-A-6MS (12119 lm, 69W)	**ES3VH-A-4MS** (17125 lm, 132W)	**ES3PU-A-6MS** (25918 lm, 170W)	**ES3V-A-6M** (41759 lm, 293W)
ES3PH-A-2MS (13201 lm, 98W)	**ES3PH-A-4MS** (17154 lm, 113W)	**ES3P-A-4M** (27042 lm, 171W)	**ES3VU-A-6M** (50344 lm, 367W)
ES3P-A-4MS (13521 lm, 86W)	**ES3P-A-6MS** (20838 lm, 130W)	**ES3V-A-4M** (28078 lm, 200W)	**ES3PU-A-6M** (51835 lm, 341W)
ES3P-A-2M (13521 lm, 86W)	**ES3V-A-6MS** (20880 lm, 146W)	**ES3PH-A-6MS** (35635 lm, 244W)	**ES3PH-A-6M** (71270 lm, 489W)

Color Temp[1]

40
4000K

50
5000K

Other CCT Available upon request

Distribution

Wide
Wide Distribution

Aisle[10]
Aisle Distribution

Lens

CL
Clear Lens

FR
Frosted Lens

Voltage

LV
120-227V

HV
347-480V

Mounting

CRM[6]
Cable Ready (Standard) and has center opening to accept 3/4" stem

MBR[1]
Includes fixture mounting box and bracket for surface mount applications Adds 1.125" to fixture height

HOOK[1]
Field installed mounting kit, includes hook and one pair of levleing cables for hook/loop applications

MBRWT
Includes field installed MBR with factory installed balancing weight

HKWT[1]
Mounting kit including field installed hook and factory installed balancing weight

Dimming

10V
0–10V Interface (standard)

OCC Sensors

OCCN
No Sensor (standard)

OCC8[1]
Occ Sensor, on/off 8' Mounting Height

OCC20[1, 2]
Occ Sensor, on/off 20' Mounting Height

OCC40[1, 2]
Occ Sensor, on/off 40' Mounting Height

OCCDIM8[1, 4, 5]
Occ Sensor, dimmable 8' Mounting Height

OCCDIM20[1, 4, 5]
Occ Sensor, dimmable 20' Mounting Height

OCCDIM40[1, 4, 5]
Occ Sensor, dimmable 40' Mounting Height

DAINT[1, 3, 4,9]
Kit includes Daintree Wireless Fixture

DAINTR[1, 3, 4, 9]
Fixture is Factory Wired for easy integration of Daintree Wireless Controls

Cord & Plug

CORDN
No cord/plug (standard)

C6W[1, 8]
6ft cord, 15A, no plug

C15W[1,8]
15ft cord, 15A, no plug

C515[1, 8]
6ft cord, 15A, straight plug 120V (5-15P)

CL515[1,8]
6ft cord, 15A, locking plug 120V (L5-15P)

CL715[1, 8]
6ft cord, 15A, locking plug 277V (L7-15P)

CL720[1, 8]
6ft cord, 20A, locking plug 277V (L7-20P)

CL2420[1, 8]
6ft cord, 20A, locking plug 347V (L24-20P)

CL820[1,8]
6ft cord, 20A, locking plug 480V (L8-20P)

Battery Backup

EMBN
No emergency battery back-up available (standard)

EMBR[1, 4, 7, 9]
Fixture is EMB-Ready, with test button, indicator lamp and wiring harness factory installed

Option

OPTN
No Option

QDC
Driver Quick Disconnect

PROLV
Fixture installed Surge Protector 120-277V

PROHV
Fixture installed Surge Protector 347-480V

QDLV
Quick Disconnect with LV Surge Protector

QDHV
Quick Disconnect with HV Surge Protector

When submitting for utility incentives and rebates, please use part numbers. Please see our DLC Cross Reference Part Number Guide for mating the Catalog Ordering Code to the corresponding part number at www.flexlightingsolutions.com/pdf/DLC/ES3-DLC-CrossRef.pdf

[1] Optional add-on. See price list for pricing.

[2] Optional add-on for 120-277V only. High voltage options available as special order with longer lead time. Contact factory for pricing and lead time.

[3] Daintree options do not include Daintree ControlScope SoftwareTM, wireless connection hardware/infrastructures, or field commissioning. Consult Daintree for more information and ordering assistance.

[4] Optional add-on available in 120-277V only.

[5] Wireless programmer required for final field setup. See ACCESSORIES.

[6] Optional CABLEKIT ordered separately. See ACCESSORIES.

[7] Field installed EMB KIT must be ordered with this option. See ACCESSORIES.

[8] All cords are 16/3 AWG, 600V, and white.

[9] Consult factory for orders requiring DAINTR and EMBR.

[10] Aisle Lens option available in Clear only

ULTRA RT6 HO LED

Recessed Downlight Kit

RT6 HO **RT5/6**

SYLVANIA ULTRA RT6 HO is a universal input voltage 5" and 6" compatible LED recessed downlight kit that creates high performing white light and is optimized for new construction and retrofit applications utilizing pin based compact fluorescent lamps. Installation is done quickly and easily in most standard six-inch frames.

The RT6 HO downlight is offered in 900 lumen and 1500 lumen options and achieves up to 71 lumens per watt.

The RT6 HO is designed to deliver light output comparable to traditional 1x18W, 1x26W and 2x26W pin based compact fluorescent luminaires.

Key Features & Benefits

- 120-277 universal input voltage
- Lumen package:
  - 900 lumens @ 13 watts (0-10V Dimmable)
  - 1500 lumens @ 21 watts (Not dimmable)
- Replacement for 18W, 26W and 32W CFL pin based lamps
- Fits in standard 5" and 6" CFL mounting frame
- CCT: 2700K, 3000K, 3500K & 4000K
- CRI of >80
- 50,000 hour life (L_{70})
- Suitable for dry, damp and wet locations
- UL1598 Listed and Classified for stand-alone and retrofit applications
- Reduces energy consumption up to 34%
- Lasts up to 4 times longer than compact fluorescent lamps
- No warm-up time, instant-on with full light output and stable lamp to lamp color
- Integrated white trim and metal conduit adaptor (included) for direct replacement

Product Offering

Ordering Abbreviation	Wattage	CCT
LED/RT5/6/HO/900	13	2700K, 3000K, 3500K, 4000K
LED/RT6/HO/1500	21	3000K, 3500K, 4000K

Application Information

Application Notes

1. Operating temperature range between -4°F and +104°F (-20°C and +40°C).
2. Suitable for use in indoor dry, damp and wet location commercial application environments.
3. Compatible with Philips Bodine ELI-S-20 Emergency Lighting Micro Inverter.
4. Designed to install in standard 6" CFL mounting frame. For a list of compatible housings, please refer to www.sylvania.com/RT6.
5. For detailed warranty information, please see www.sylvania.com/RT6.
6. RT6/HO 1500 lumen is not intended for use in dimming applications.
7. The RT5/6 HO 900 lumen is compatible with Leviton 0-10V dimmer model IP710-DL.
8. For installation in non-insulated ceilings: If insulation is present, it may be placed around the retrofit kit as long as a three-inch space is maintained around the kit.
9. Installation performed as a stand-alone kit (without frame) is recommended for hard ceiling. Installation of a recessed incandescent frame (such as Lightolier model 1102P1) is recommended for tiled ceiling application for proper support of the retrofit kit.

Specifications and Certifications

Specification Data

Catalog #	Type
Project	
Comments	
Prepared by	

Specifications

Energy Data

Minimum Starting Temp: -20°C (-4°F)

EMI/RFI: RT6/HO 1500 lumen: FCC Title 47 CFR, Part 15, Class B
RT6/HO 900 lumen: FCC Title 47 CFR, Part 15, Class A

Sound Rating: <24dBA

Input Voltage: 120-277V

Power Factor: >0.90

Input Frequency: 60Hz

THD: <20%

Input Power: 13W & 21W

Input Current: 0.15A @ 120V; 0.07A @ 277V

Maximum Ambient Operating Temperature (Non-Insulated Ceiling): 40°C (104°F)

Lighting Data

Lumen Output: 900 and 1500

Lumens per Watt: 71

Color

Correlated Color Temperature (CCT): 2700K, 3000K, 3500K, 4000K

Color Rendering Index (CRI): >80

Product weight: 1.6lb

Ordering Information

Item Number	Ordering Abbreviation	Recessed Housing	Replaced CFL Wattage	Nominal Wattage (W)	Delivered Light Output (lm)	Color Temperature	Avg. Rated Life (hrs)*	Packaging Configuration	Dimmable
75137	RT5/6/HO/900/827	5" and 6"	18W	13	900	2700K	50,000	4/case	YES
75138	RT5/6/HO/900/830	5" and 6"	18W	13	900	3000K	50,000	4/case	YES
75140	RT5/6/HO/900/835	5" and 6"	18W	13	900	3500K	50,000	4/case	YES
75139	RT5/6/HO/900/840	5" and 6"	18W	13	900	4000K	50,000	4/case	YES
72487	LED/RT6/1500/HO/830	6"	26W & 32W	21	1500	3000K	50,000	4/case	NO
72494	LED/RT6/1500/HO/835	6"	26W & 32W	21	1500	3500K	50,000	4/case	NO
72495	LED/RT6/1500/HO/840	6"	26W & 32W	21	1500	4000K	50,000	4/case	NO

* LED lamp life is defined as the number of hours when 50% of an average group of identical lamps reached 70% of its initial lumens.

Ordering Guide

LED	/	RT6	/	1500	/	HO	/	8	30
LED		Product Name RT6 5/6 = fits 5" and 6" frames 6 = fits 6" frames		Light Output 1500lm 900lm		High Outout		CRI >80	Color Temperature 2700K, 3000K, 3500K, 4000K

Energy Savings

Basic Product Description	LED Lumens	LED Life	Traditional Lamp Types	Lumens	Life	Watts Saved With RT6	RT6 Energy Savings*	RT6 Life Benefit
RT5/6 HO 13W	900	50,000	18W CFL DD, DT	1200	16,000	5	$27	3X
RT6/HO 21W	1500	50,000	26W CFL DD, DT	1800	16,000	5	$27	3X
RT6/HO 21W	1500	50,000	32W CFL DD, DT	2400	16,000	11	$60	3X

* Based on $0.11/kWh over 50,000 hours life.

Accessories

RT5/6 Retrofit Trim

75095	RT/5/6/TRIM/DKBZ
75097	RT/5/6/TRIM/BLK
75098	RT/5/6/TRIM/ORBZ

75097 75098

TOUGHDRUM®

DURABLE AND BEAUTIFUL LED FIXTURE | POWERED BY OUR LEDCR®

Don't let its good looks fool you. Same rugged quality as the outdoor drum, with beautiful black anodized trim. The fixture is designed to safely and quickly replace any existing incandescent or fluorescent fixture. Includes all of the mounting hardware and electrical connections required. Optional integrated occupancy sensor dims fixture to low energy mode when space is unoccupied.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

MANUFACTURER	MODEL NUMBER	SIZE	LUMENS	COLOR TEMP	OPTIONS
RPT	TOUGHDRUM	13IN			
			1600LM	3000K*	OCC HI/LO VARIABLE OCCUPANCY SENSOR
			2200LM	4000K	10VDIM 0-10V DIMMABLE
					EMG EMERGENCY BATTERY BACKUP
					120 LVD TRIAC/PHASE DIMMABLE
					277 LVD TRIAC/PHASE DIMMABLE

ORDERING EXAMPLE

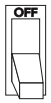
RPT-TOUGHDRUM-13IN-1600LM-3000K-OCC

* 3000K part number can be used for 3000-3500K

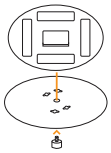
LEDCR LIGHT ENGINE

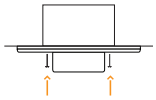
The ToughDrum is powered by our patented, infield replacable and upgradable light engine. See LEDCR cut sheet for more information.

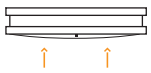
INSTALLATION GUIDE

1. 

Turn off power to the fixture.

2. 
Make connections & using provided brass nut, tighten LEDCR plate onto fixture.

3. 
Install LEDCR/fixture base assembly to existing junction box using longer provided screws.

4. 
Install fixture lens, turn on power.

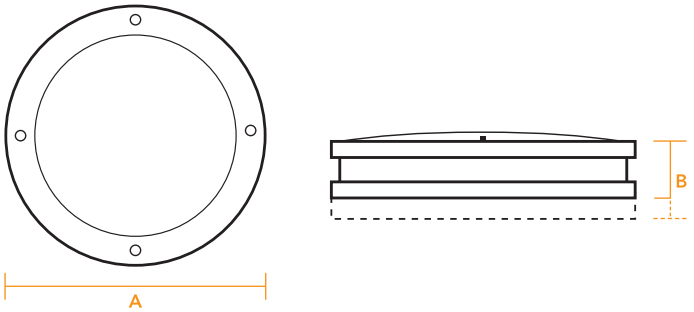
Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC
EFFICACY	>120 LPW @ 4000K
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	85+
WARRANTY	5 years
CERTIFICATIONS	
PERFORMANCE LISTINGS	

May be protected under the following US patents
US 8,106569 | US 8,882,298 | Additional patents pending.

DIMENSIONS



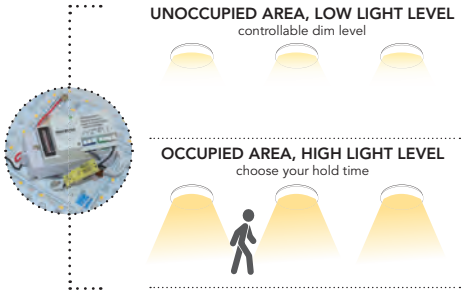
DIMENSIONS (INCHES)	A	B
RPT-TOUGHDRUM-13IN (without optional EMG)	13	3.75
RPT-TOUGHDRUM-13IN (with optional EMG)	13	5.25

TOUGHDRUM® DURABLE AND BEAUTIFUL LED FIXTURE | POWERED BY OUR LEDCR®

ORDERING GUIDE

QUICK SHIP	DLC E*	PART #	LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
	E*	RPT-TOUGHDRUM-13IN-1600LM-3000K	1350	12	3000	120-277	5	3 x 13W CFL (45W)	33
	E*	RPT-TOUGHDRUM-13IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
	DLC E*	RPT-TOUGHDRUM-13IN-1600LM-3000K-OCC	1350	14hi/3lo	3000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
	DLC E*	RPT-TOUGHDRUM-13IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
	E*	RPT-TOUGHDRUM-13IN-2200LM-3000K	1900	18	3000	120-277	5	2 x 26W CFL (54W)	36
	E*	RPT-TOUGHDRUM-13IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
	DLC E*	RPT-TOUGHDRUM-13IN-2200LM-3000K-OCC	1900	20hi/4lo	3000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
	DLC E*	RPT-TOUGHDRUM-13IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo

OPTIONAL FACTORY INSTALLED OCC SENSOR



The LEDCR can be paired with our integral occupancy sensor for maximum energy savings. Unlike traditional passive infrared or ultrasonic occupancy sensors, this high-frequency sensor can be hidden behind the lens of an existing fixture, eliminating the need for external sensors and providing a clean look.

OPTIONAL FACTORY INSTALLED EMG BACKUP

The LEDCR can be paired with an Emergency battery backup. Provides over 90 minutes of safe light levels when power goes out. Battery backup is installed in fixture housing without the need for increasing fixture height.

OPTIONAL TRIM COLORS AND COLLAR

The ToughDrum® housing metal trim can be custom powder coated to virtually color. Also stand-off collar can be provided for mounting of fixture to hard surfaces. Contact us for details.

RemPhos TECHNOLOGIES

RemPhos Technologies LLC • p 877.997.3674 • www.remphos.com
90 Holten Street • Danvers, MA USA • sales@remphos.com

OSQ Series

OSQ™ LED Area/Flood Luminaire – Medium

Product Description

The OSQ™ Area/Flood luminaire blends extreme optical control, advanced thermal management and modern, clean aesthetics. Built to last, the housing is rugged cast aluminum with an integral, weathertight LED driver compartment. Versatile mounting configurations offer simple installation. Its slim, low-profile design minimizes wind load requirements and blends seamlessly into the site providing even, quality illumination. 'A' and 'B' Input power designators are a suitable upgrade for HID applications up to 250 Watt. 'J' and 'K' Input power designators are a suitable upgrade for HID applications up to 400 Watt.

Applications: Parking lots, walkways, campuses, car dealerships, office complexes, and internal roadways

Performance Summary

NanoOptic® Precision Delivery Grid™ optic

Made in the U.S.A. of U.S. and imported parts

Initial Delivered Lumens: Up to 17,191

Efficacy: Up to 136 LPW

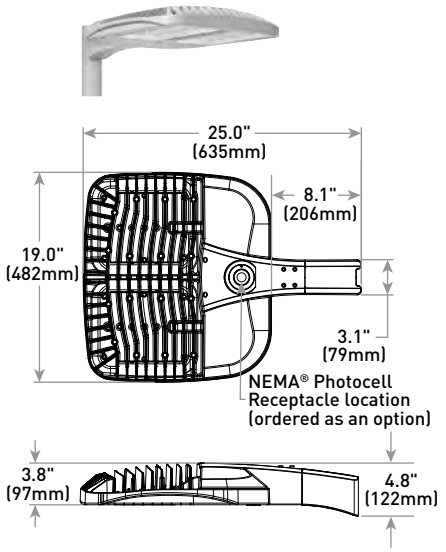
CRI: Minimum 70 CRI (4000K & 5700K; 3000K asymmetric optics); 80 CRI (3000K symmetric optics)

CCT: 3000K (+/- 300K), 4000K (+/- 300K), 5700K (+/- 500K)

Limited Warranty†: 10 years on luminaire/10 years on Colorfast DeltaGuard® finish

†See http://lighting.cree.com/warranty for warranty terms

DA Mount



Weight
26.5 lbs. (12kg)

Accessories

Field-Installed	
Backlight Shield OSQ-BLSMF – Front facing optics OSQ-BLSMR – Rotated optics	**Hand-Held Remote** XA-SENSREM - For successful implementation of the programmable multi-level option, a minimum of one hand-held remote is required

Ordering Information

Fully assembled luminaire is composed of two components that must be ordered separately:
Example: **Mount:** OSQ-AASV + **Luminaire:** OSQ-A-NM-2ME-A-40K-UL-SV

Mount (Luminaire must be ordered separately)			
OSQ-			
OSQ-AA Adjustable Arm **OSQ-DA** Direct Arm	**Color Options:**	**SV** Silver **BK** Black	**BZ** Bronze **WH** White

Luminaire (Mount must be ordered separately)

OSQ	A	NM						
Product	**Version**	**Mounting**	**Optic**	**Input Power Designator**	**CCT**	**Voltage**	**Color Options**	**Options**
OSQ	A	**NM** No Mount	**Asymmetric** **2ME*** Type II Medium **4ME*** Type IV Medium **3ME*** Type III Medium **Symmetric** **5ME** Type V Medium **5SH** Type V Short **WSN** Wide Sign **15D** 15° Flood **25D** 25° Flood **40D** 40° Flood **60D** 60° Flood	**A** 112W **J** 168W **B** 86W **K** 130W	**30K** 3000K **40K** 4000K **57K** 5700K	**UL** Universal 120-277V **UH** Universal 347-480V	**BK** Black **BZ** Bronze **SV** Silver **WH** White	**DIM** 0-10V Dimming - Control by others - Refer to Dimming spec sheet for details - Can't exceed wattage of specified input power designator **F** Fuse - When code dictates fusing, use time delay fuse **ML** Multi-Level - Refer to ML spec sheet for details - High: 100%, Low: 30% - Available with UL voltage only - Intended for downlight applications at 0° tilt **PML** Programmable Multi-Level, 20-40' Mounting Height - Refer to PML spec sheet for details - Available with UL voltage only - Intended for downlight applications at 0° tilt **PML2** Programmable Multi-Level, 10-30' Mounting Height - Refer to PML spec sheet for details - Available with UL voltage only - Intended for downlight applications at 0° tilt **Q9** Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details **R** NEMA® Photocell Receptacle - Intended for downlight applications with maximum 45° tilt - 3-pin receptacle per ANSI C136.10 - Photocell and shorting cap by others **RL** Rotate Left - LED and optic are rotated to the left **RR** Rotate Right - LED and optic are rotated to the right

* Available with Backlight Shield when ordered with field-installed accessory (see table above)

Rev. Date: V8 05/23/2016

US: lighting.cree.com/lighting T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Product Specifications

CONSTRUCTION & MATERIALS

- Slim, low profile design minimizes wind load requirements
- Luminaire housing is rugged die cast aluminum with an integral, weathertight LED driver compartment and high performance heat sink
- Convenient interlocking mounting method on direct arm mount. Mounting adaptor is rugged die cast aluminum and mounts to 3-6" (76-152mm) square or round pole, secured by two 5/16-18 UNC bolts spaced on 2" (51mm) centers
- Mounting for the adjustable arm mount adaptor is rugged die cast aluminum and mounts to 2" (51mm) IP, 2.375" (60mm) O.D. tenon
- Adjustable arm mount can be adjusted 180˚ in 2.5˚ increments
- Designed for uplight and downlight applications
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Silver, bronze, black, and white are available
- **Weight:** 26.5 lbs. (12kg)

ELECTRICAL SYSTEM

- **Input Voltage:** 120-277V or 347-480V, 50/60Hz, Class 1 drivers
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used
- **10V Source Current:** 0.15mA

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- Suitable for wet locations
- Enclosure rated IP66 per IEC 60529 when ordered without R option
- Consult factory for CE Certified products
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets FCC Part 15 , Subpart B, Class A standards for conducted and radiated emissions
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA
- DLC qualified when ordered with asymmetric optics with 40K or 57K. Please refer to www.designlights.org/QPL for most current information
- RoHS compliant. Consult factory for additional details

Electrical Data*

Input Power Designator	Optic	System Watts 120-480V	Total Current					
			120V	208V	240V	277V	347V	480V
A	Asymmetric	112	0.97	0.56	0.49	0.43	0.34	0.25
J		168	1.47	0.85	0.74	0.64	0.50	0.36
B	Symmetric	86	0.73	0.43	0.37	0.32	0.25	0.19
K		130	1.09	0.65	0.56	0.49	0.38	0.28

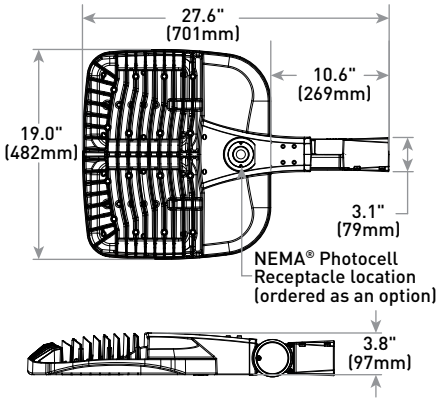
* Electrical data at 25˚C (77˚F). Actual wattage may differ by +/- 10% when operating between 120-480V +/-10%

Recommended OSQ Series Lumen Maintenance Factors (LMF)[1]

Ambient	Optic	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Projected[2] LMF	100K hr Calculated[3] LMF
5˚C (41˚F)	Asymmetric	1.04	0.99	0.93	0.89	0.84
	Symmetric	1.05	1.00	0.96[3]	0.92[3]	0.88[3]
10˚C (50˚F)	Asymmetric	1.03	0.98	0.93	0.88	0.83
	Symmetric	1.04	0.99	0.95[3]	0.91[3]	0.87[3]
15˚C (59˚F)	Asymmetric	1.02	0.97	0.92	0.87	0.82
	Symmetric	1.02	0.98	0.94[3]	0.90[3]	0.87[3]
20˚C (68˚F)	Asymmetric	1.01	0.96	0.91	0.86	0.82
	Symmetric	1.01	0.96	0.92[3]	0.88[3]	0.85[3]
25˚C (77˚F)	Asymmetric	1.00	0.95	0.90	0.85	0.81
	Symmetric	1.00	0.95	0.91[3]	0.88[3]	0.84[3]

[1] Lumen maintenance values at 25˚C (77˚F) are calculated per TM-21 based on LM-80 data and in-situ luminaire testing
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT] i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT] i.e. the packaged LED chip)

AA Mount



Weight
26.5 lbs. (12kg)

Appendix A9

RISE ENGINEERING™
Division of Thielsch Engineering, Inc
1341 Elmwood Avenue
Cranston, Rhode Island 02910

EVERSOURCE

Ralph Wheelock School LED Lighting Upgrades

NEW LED CLASSROOM WRAP FIXTURES, LED TUBES/BYPASS BALLASTS & EXTERIOR LED

Financial Summary

Total Project Cost	**$**	**166,183**
Estimated Electric Incentive	**$**	**(18,620)**
Customer Net Cost	**$**	**147,563**
Estimated Energy Cost Savings Annually	**$**	**12,290**
Estimated Maintenance Savings	**$**	**2,754**
Return on Investment (ROI)		**10%**
Simple Payback in Years		**9.8**

Energy Savings

kW Reduction	kWh Reduction
22.50	**74,482**

Pollution Savings

CO2 Reduction (lbs)	NOx Reduction (lbs)	SO2 Reduction (lbs)
94,369	**79.9**	**295.3**

Prepared: 10/11/2016

RISE ENGINEERING

Ralph Wheelock School
17 Elm Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	kW Saved	kWh Saved
1	RALPH WHEELOCK	BEHIND STAGE	A1	1X8 4L4' T8 30W/LP OLD WRAP	14	2856	101	1.41	4,038	NEW 1X8 RENOVA 59W LED WRAP	14	2856	59	0.83	2359	0.59	1,679
2	RALPH WHEELOCK	STAIR	B1	1X4 2L4' T8 30W/LP OLD WRAP	1	8760	52	0.05	456	NEW 1X4 RENOVA 30W LED WRAP	1	8760	30	0.03	263	0.02	193
3	RALPH WHEELOCK	STORAGE	B1	1X4 2L4' T8 30W/LP OLD WRAP	2	1000	52	0.10	104	NEW 1X4 RENOVA 30W LED WRAP	2	1000	30	0.06	60	0.04	44
4	RALPH WHEELOCK	CAFETERIA CORRIDOR	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	9	4836	52	0.47	2,263	NEW 1X8 RENOVA 22W LED WRAP	9	4836	22	0.20	958	0.27	1,306
5	RALPH WHEELOCK	MAIN CORRIDOR	D1	1X2 4L2' T8 17W/NP NEW WIDE WRAP	10	4836	62	0.62	2,998	RETROFIT RPT 1L2' 9W T8 LED/BYPASS BALLAST	10	4836	36	0.36	1741	0.26	1,257
6	RALPH WHEELOCK	CAFETERIA	A1	1X8 4L4' T8 30W/LP OLD WRAP	24	4836	101	2.42	11,722	NEW 1X8 RENOVA 59W LED WRAP	24	4836	59	1.42	6848	1.01	4,875
7	RALPH WHEELOCK	KITCHEN	A3	1X8 4L4' T8 30W/LP OLD VAPOR TIGHT	9	2856	101	0.91	2,596	NEW 1X8 TECHBRITE 59W LED VAPOR TIGHT	9	2856	59	0.53	1517	0.38	1,080
8	RALPH WHEELOCK	KITCHEN	B2	1X4 2L4' T8 30W/LP OLD VAPOR TIGHT	5	2856	52	0.26	743	NEW 1X4 TECHBRITE 38W LED VAPOR TIGHT	5	2856	38	0.19	543	0.07	200
9	RALPH WHEELOCK	DRY STORAGE	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	8	1000	26	0.21	208	NEW 1X4 RENOVA 12W LED WRAP	8	1000	12	0.10	96	0.11	112
10	RALPH WHEELOCK	KITCHEN HALL	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	2	2856	26	0.05	149	NEW 1X4 RENOVA 12W LED WRAP	2	2856	12	0.02	69	0.03	80
11	RALPH WHEELOCK	WASHROOM	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	3	2856	26	0.08	223	NEW 1X4 RENOVA 12W LED WRAP	3	2856	12	0.04	103	0.04	120
12	RALPH WHEELOCK	KITCHEN OFFICE	B1	1X4 2L4' T8 30W/LP OLD WRAP	1	2856	52	0.05	149	NEW 1X4 RENOVA 30W LED WRAP	1	2856	30	0.03	86	0.02	63
13	RALPH WHEELOCK	CONFERENCE ROOM	D2	3X3 (2) 3L3' T8 25W/NP OLD WOOD SURFACE BOX	4	2856	67	0.27	765	RETROFIT RPT 3L3' 12W T8 LED/BYPASS BALLAST/NEW POLYCARB 3X3 LENS	4	2856	36	0.14	411	0.12	354
14	RALPH WHEELOCK	LARGE GYM	G1	1X4 2L4' T5HO 54W/PSEB HIF GYM W/ SENSOR	12	4836	117	1.40	6,790	NEW LUSIO 4MS 88W LED LOWBAY OCC40	12	4836	88	1.06	5107	0.35	1,683
15	RALPH WHEELOCK	GYM CORRIDOR	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	6	4836	52	0.31	1,509	NEW 1X8 RENOVA 22W LED WRAP	6	4836	22	0.13	638	0.18	870
16	RALPH WHEELOCK	GYM STORAGE	A1	1X8 4L4' T8 30W/LP OLD WRAP	1	1000	101	0.10	101	NEW 1X8 RENOVA 59W LED WRAP	1	1000	59	0.06	59	0.04	42
17	RALPH WHEELOCK	GYM STORAGE	I1	60W INCANDESCENT DRUM	4	1000	60	0.24	240	NEW REMPHOS 14W LED DRUM	4	1000	14	0.06	56	0.18	184
18	RALPH WHEELOCK	GYM OFFICE	A1	1X8 4L4' T8 30W/LP OLD WRAP	2	2856	101	0.20	577	NEW 1X8 RENOVA 59W LED WRAP	2	2856	59	0.12	337	0.08	240
19	RALPH WHEELOCK	1ST FLOOR CORRIDOR	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	23	4836	52	1.20	5,784	NEW 1X8 RENOVA 22W LED WRAP	23	4836	22	0.51	2447	0.69	3,337
20	RALPH WHEELOCK	ROOMS 110, 112, 114, 116	A1	1X8 4L4' T8 30W/LP OLD WRAP	24	2856	101	2.42	6,923	NEW 1X8 RENOVA 59W LED WRAP	24	2856	59	1.42	4044	1.01	2,879
21	RALPH WHEELOCK	ROOMS 110, 112, 114, 116	B1	1X4 2L4' T8 30W/LP OLD WRAP	24	2856	52	1.25	3,564	NEW 1X4 RENOVA 30W LED WRAP	24	2856	30	0.72	2056	0.53	1,508
22	RALPH WHEELOCK	ROOMS 101/103/105/107-109/111	A1	1X8 4L4' T8 30W/LP OLD WRAP	63	2856	101	6.36	18,173	NEW 1X8 RENOVA 59W LED WRAP	63	2856	59	3.72	10616	2.65	7,557
23	RALPH WHEELOCK	ELEVATOR LOBBY	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	1	4836	26	0.03	126	NEW 1X4 RENOVA 12W LED WRAP	1	4836	12	0.01	58	0.01	68
24	RALPH WHEELOCK	RESTROOMS	D3	1X2 2L2' T8 17W/NP OLD BOX WRAP	4	2856	37	0.15	423	NEW 1X2 RENOVA 9W LED WRAP	4	2856	9	0.04	103	0.11	320
25	RALPH WHEELOCK	RESTROOMS	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	4	2856	26	0.10	297	NEW 1X4 RENOVA 12W LED WRAP	4	2856	12	0.05	137	0.06	160
26	RALPH WHEELOCK	JANITOR CLOSET	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	2	1000	52	0.10	104	NEW 1X8 RENOVA 22W LED WRAP	2	1000	22	0.04	44	0.06	60
27	RALPH WHEELOCK	ROOMS 102, 104, 106	A1	1X8 4L4' T8 30W/LP OLD WRAP	33	2856	101	3.33	9,519	NEW 1X8 RENOVA 59W LED WRAP	33	2856	59	1.95	5561	1.39	3,958
28	RALPH WHEELOCK	ROOMS 102, 104, 106	B1	1X4 2L4' T8 30W/LP OLD WRAP	3	2856	52	0.16	446	NEW 1X4 RENOVA 30W LED WRAP	3	2856	30	0.09	257	0.07	188

RISE ENGINEERING

Ralph Wheelock School
17 Elm Street
Medfield MA 02052
Michael LaFrancesca

ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	kW Saved	kWh Saved
29	RALPH WHEELOCK	STAIRWELL	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	3	8760	52	0.16	1,367	NEW 1X8 RENOVA 22W LED WRAP	3	8760	22	0.07	578	0.09	788
30	RALPH WHEELOCK	STAIRWELL	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	1	8760	26	0.03	228	NEW 1X4 RENOVA 12W LED WRAP	1	8760	12	0.01	105	0.01	123
31	RALPH WHEELOCK	EAST GYM	D2	3X3 (2) 3L3' T8 25W/NP OLD WOOD SURFACE BOX	36	4836	67	2.41	11,664	RETROFIT RPT 3L3' 12W T8 LED/BYPASS BALLAST/NEW POLYCARB 3X3 LENS	36	4836	36	1.30	6267	1.12	5,397
32	RALPH WHEELOCK	BOOK STORAGE	A1	1X8 4L4' T8 30W/LP OLD WRAP	2	1000	101	0.20	202	NEW 1X8 RENOVA 59W LED WRAP	2	1000	59	0.12	118	0.08	84
33	RALPH WHEELOCK	BOOK STORAGE	B1	1X4 2L4' T8 30W/LP OLD WRAP	2	1000	52	0.10	104	NEW 1X4 RENOVA 30W LED WRAP	2	1000	30	0.06	60	0.04	44
34	RALPH WHEELOCK	FACULTY ROOM	A1	1X8 4L4' T8 30W/LP OLD WRAP	4	2856	101	0.40	1,154	NEW 1X8 RENOVA 59W LED WRAP	4	2856	59	0.24	674	0.17	480
35	RALPH WHEELOCK	RESTROOMS	I1	60W INCANDESCENT DRUM	2	2856	60	0.12	343	NEW REMPHOS 14W LED DRUM	2	2856	14	0.03	80	0.09	263
36	RALPH WHEELOCK	RESTROOMS	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	2	2856	26	0.05	149	NEW 1X4 RENOVA 12W LED WRAP	2	2856	12	0.02	69	0.03	80
37	RALPH WHEELOCK	1ST FLR CLASSROOMS BATHROOMS	I1	60W INCANDESCENT DRUM	8	2856	60	0.48	1,371	NEW REMPHOS 14W LED DRUM	8	2856	14	0.11	320	0.37	1,051
38	RALPH WHEELOCK	1ST FLR CLASSROOMS BATHROOMS	B1	1X4 2L4' T8 30W/LP OLD WRAP	4	2856	52	0.21	594	NEW 1X4 RENOVA 30W LED WRAP	4	2856	30	0.12	343	0.09	251
39	RALPH WHEELOCK	WATER STORAGE	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	4	1000	26	0.10	104	NEW 1X4 RENOVA 12W LED WRAP	4	1000	12	0.05	48	0.06	56
40	RALPH WHEELOCK	STORAGE	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	2	1000	52	0.10	104	NEW 1X8 RENOVA 22W LED WRAP	2	1000	22	0.04	44	0.06	60
41	RALPH WHEELOCK	2ND FLR CORRIDOR	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	17	4836	52	0.88	4,275	NEW 1X8 RENOVA 22W LED WRAP	17	4836	22	0.37	1809	0.51	2,466
42	RALPH WHEELOCK	CLASSROOMS 201-209, 211	A1	1X8 4L4' T8 30W/LP OLD WRAP	102	2856	101	10.30	29,423	NEW 1X8 RENOVA 59W LED WRAP	102	2856	59	6.02	17187	4.28	12,235
43	RALPH WHEELOCK	CONFERENCE ROOM 2 A/B	A1	1X8 4L4' T8 30W/LP OLD WRAP	6	2856	101	0.61	1,731	NEW 1X8 RENOVA 59W LED WRAP	6	2856	59	0.35	1011	0.25	720
44	RALPH WHEELOCK	STAIRWELL	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	2	8760	52	0.10	911	NEW 1X8 RENOVA 22W LED WRAP	2	8760	22	0.04	385	0.06	526
45	RALPH WHEELOCK	BATHROOMS	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	6	2856	26	0.16	446	NEW 1X4 RENOVA 12W LED WRAP	6	2856	12	0.07	206	0.08	240
46	RALPH WHEELOCK	BATHROOMS	D3	1X2 2L2' T8 17W/NP OLD BOX WRAP	2	2856	37	0.07	211	NEW 1X2 RENOVA 9W LED WRAP	2	2856	9	0.02	51	0.06	160
47	RALPH WHEELOCK	JANITOR/FACULTY BATHROOM	I1	60W INCANDESCENT DRUM	2	1000	60	0.12	120	NEW REMPHOS 14W LED DRUM	2	1000	14	0.03	28	0.09	92
48	RALPH WHEELOCK	JANITOR/FACULTY BATHROOM	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	1	1000	26	0.03	26	NEW 1X4 RENOVA 12W LED WRAP	1	1000	12	0.01	12	0.01	14
49	RALPH WHEELOCK	STORAGE A	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	4	1000	52	0.21	208	NEW 1X8 RENOVA 22W LED WRAP	4	1000	22	0.09	88	0.12	120
50	RALPH WHEELOCK	STORAGE A	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	2	1000	26	0.05	52	NEW 1X4 RENOVA 12W LED WRAP	2	1000	12	0.02	24	0.03	28
51	RALPH WHEELOCK	ELEVATOR LOBBY	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	1	4836	26	0.03	126	NEW 1X4 RENOVA 12W LED WRAP	1	4836	12	0.01	58	0.01	68
52	RALPH WHEELOCK	CLASSROOMS 210/212/214/216	A1	1X8 4L4' T8 30W/LP OLD WRAP	24	2856	101	2.42	6,923	NEW 1X8 RENOVA 59W LED WRAP	24	2856	59	1.42	4044	1.01	2,879
53	RALPH WHEELOCK	CLASSROOMS 210/212/214/216	B1	1X4 2L4' T8 30W/LP OLD WRAP	12	2856	52	0.62	1,782	NEW 1X4 RENOVA 30W LED WRAP	12	2856	30	0.36	1028	0.26	754
54	RALPH WHEELOCK	STAIRWELL	A2	1X8 2L4' T8 30W/LP OLD BOX WRAP	2	8760	52	0.10	911	NEW 1X8 RENOVA 22W LED WRAP	2	8760	22	0.04	385	0.06	526
55	RALPH WHEELOCK	IMC ROOM	XC1	1X8 4L4' T8 30W/LP OLD WOOD SURFACE BOX	18	2856	101	1.82	5,192	RETROFIT RPT 4L4' 14W T8 LED/BYPASS BALLAST	18	2856	56	1.01	2879	0.81	2,313
56	RALPH WHEELOCK	STUDY ROOM	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	1	2856	26	0.03	74	NEW 1X4 RENOVA 12W LED WRAP	1	2856	12	0.01	34	0.01	40

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ECM: LED Lighting Upgrades

LOCATION				EXISTING CONDITIONS						PROPOSED CONDITIONS						ENERGY SAVINGS	
Line Item	Building	Room Name	Fixture Type	Existing Fixture Type	Fixt. Qty	Existing Hours	Watts	kW	kWh	Proposed Fixture Type	Fixt Qty	Proposed Hours	Watts	kW	kWh	kW Saved	kWh Saved
57	RALPH WHEELOCK	DATA CLOSET	B1	1X4 2L4' T8 30W/LP OLD WRAP	2	1000	52	0.10	104	NEW 1X4 RENOVA 30W LED WRAP	2	1000	30	0.06	60	0.04	44
58	RALPH WHEELOCK	COMPUTER ROOM	A1	1X8 4L4' T8 30W/LP OLD WRAP	4	2856	101	0.40	1,154	NEW 1X8 RENOVA 59W LED WRAP	4	2856	59	0.24	674	0.17	480
59	RALPH WHEELOCK	READING	A1	1X8 4L4' T8 30W/LP OLD WRAP	4	2856	101	0.40	1,154	NEW 1X8 RENOVA 59W LED WRAP	4	2856	59	0.24	674	0.17	480
60	RALPH WHEELOCK	SCHOOL NURSE	A1	1X8 4L4' T8 30W/LP OLD WRAP	3	2856	101	0.30	865	NEW 1X8 RENOVA 59W LED WRAP	3	2856	59	0.18	506	0.13	360
61	RALPH WHEELOCK	SCHOOL NURSE	B1	1X4 2L4' T8 30W/LP OLD WRAP	1	2856	52	0.05	149	NEW 1X4 RENOVA 30W LED WRAP	1	2856	30	0.03	86	0.02	63
62	RALPH WHEELOCK	BATHROOM	I1	60W INCANDESCENT DRUM	3	2856	60	0.18	514	NEW REMPHOS 14W LED DRUM	3	2856	14	0.04	120	0.14	394
63	RALPH WHEELOCK	OFFICE	A1	1X8 4L4' T8 30W/LP OLD WRAP	3	2856	101	0.30	865	NEW 1X8 RENOVA 59W LED WRAP	3	2856	59	0.18	506	0.13	360
64	RALPH WHEELOCK	OFFICE	B1	1X4 2L4' T8 30W/LP OLD WRAP	1	2856	52	0.05	149	NEW 1X4 RENOVA 30W LED WRAP	1	2856	30	0.03	86	0.02	63
65	RALPH WHEELOCK	OFFICE	B3	1X4 1L4' T8 30W/LP OLD BOX WRAP	1	2856	26	0.03	74	NEW 1X4 RENOVA 12W LED WRAP	1	2856	12	0.01	34	0.01	40
66	RALPH WHEELOCK	PRINCIPAL'S OFFICE	A1	1X8 4L4' T8 30W/LP OLD WRAP	2	2856	101	0.20	577	NEW 1X8 RENOVA 59W LED WRAP	2	2856	59	0.12	337	0.08	240
67	RALPH WHEELOCK	LAMINATING ROOM	A1	1X8 4L4' T8 30W/LP OLD WRAP	2	2856	101	0.20	577	NEW 1X8 RENOVA 59W LED WRAP	2	2856	59	0.12	337	0.08	240
68	RALPH WHEELOCK	LAMINATING ROOM	D3	1X2 2L2' T8 17W/NP OLD BOX WRAP	1	2856	37	0.04	106	NEW 1X2 RENOVA 9W LED WRAP	1	2856	9	0.01	26	0.03	80
69	RALPH WHEELOCK	EXTERIOR WALL PACKS	WP1	250W MH WALLPACK BZ W/ OUTLET	3	4380	295	0.89	3,876	NEW LITHONIA 40W LED MEDIUM WALLPACK	3	4380	40	0.12	526	0.77	3,351
70	RALPH WHEELOCK	EXTERIOR CANOPY	I2	60W INCANDESCENT CANOPY	11	4380	60	0.66	2,891	NEW REMPHOS 20W LED TOUGH DRUM	11	4380	20	0.22	964	0.44	1,927
71	RALPH WHEELOCK	EXTERIOR JELLY JARS	JJ1	60W INCANDESCENT JELLY JAR	1	4380	60	0.06	263	NEW LITHONIA 40W LED MEDIUM WALLPACK	1	4380	40	0.04	175	0.02	88
TOTALS					**612**			**50.07**	**164,099**		**612**			**27.57**	**89617**	**22.50**	**74,482**

Prepared: 10/11/2016

RENOVA
Innovative Lighting Ideas
Energy Efficient Solutions

Category: LED

Narrow Profile Wrap

Prefix: NPW

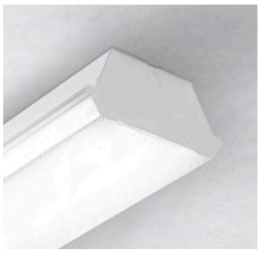
The Narrow Profile Wrap (NPW) Fixture family has been developed to dramatically improve energy efficiency and quality of light using Solid State Lighting (SSL) technologies. The Narrow Profile Wrap Series provides an attractive, low profile, energy efficient architectural look which has been specifically designed to replace existing fluorescent lighting or for use in new construction. Comfortable, low glare, uniform lighting is attributed to this style of fixture. Typical applications for this type of product are interior spaces where finished ceilings and walls exist. Applications include:

- *Commercial/Corporate Office Spaces*
- *Retail Spaces, Public Spaces and Airports*
- *Schools, Colleges and Universities*
- *Hospitals, Government Facilities and Military Bases*

VETERAN OWNED AND OPERATED · RoHS COMPLIANT · made in USA · c UL us LISTED · Illuminating Engineering Society Sustaining Member

Narrow Profile Wrap
(Shown with Optional Frosted Lens)

Clear, Prismatic
Lens Shown
(Standard)



project:

fixture type:

catalog #:

quantity:

ORDERING GUIDE

NPW - ____ - ____ - ____ - ____ - ____ - ____ - ____ - ____ - ____

PREFIX/ SERIES	SIZE	OPTICS (DISTRIBUTION)	LUMEN OUTPUT*	DRIVER VOLTAGE	DRIVER TYPE	COLOR TEMP.	LENS (DIFFUSER)	HOUSING COLOR / FINISH	FIXTURE OPTIONS
NPW - Narrow Profile Wrap Fixture	**1** - 1' **2** - 2' **3** - 3' **4** - 4' **6** - 6' **8** - 8'	**N** - Normal **C** - Custom (Specify)	**L010** **L130** **L020** **L140** **L030** **L150** **L040** **L160** **L050** **L170** **L060** **L180** **L070** **L190** **L080** **L200** **L090** **L210** **L100** **L220** **L110** **L230** **L120** **L240** **LC** - Custom (Specify)	**UNV** - Universal Voltage (120v - 277v) (60 Hz) (Standard) **120** - 120v, 60Hz **277** - 277v, 60Hz **347** - 347v *Special Order Only	**DM** - 0-10v Low Voltage Dimming (10% - 100%) (Standard) **SD** - Step Dimming (50% / 100%) **LV** - Line Voltage Dimming *Specify Voltage (120v or 277v)	**C27** - 2700 K* **C30** - 3000 K* **C35** - 3500 K **C40** - 4000 K **C50** - 5000 K* *Special Order Only	**AP** - Clear, Linear Prismatic Acrylic Lens (Standard) **AF** - Frosted Linear Prism Acrylic Lens (Optional) **CS** - Custom (Specify)	**PP** - Prepainted (White) (Standard With Pop Rivet Construction) **GW** - Gloss White (Smooth) **TW** - Textured White **TB** - Textured Black **CS** - Custom Finish (Specify)	**OS** - Occupancy Sensor **DL** - Daylight Havesting Sensor **OD** - Occupancy/ Daylight Sensor **OS** - OSRAM Wireless Sensor **EN** - "Encelium" Wireless Sensor **DS** - Digital Sensor **DT** - "DainTree" Wireless Sensor **EM** - Emergency Battery Pack *

*L(x) = Delivered Lumens
Example: L090 = 9,000 Lumens

24'–0"

8' HSG	6' HSG	4' HSG	3' HSG	2' HSG	1' HSG

*EXAMPLE: CONTINUOUS ROW @ 1000 LUMENS PER FOOT

(QTY=1) NPW8-N-L080-UNV-DM-C40-AF-PP
(QTY=1) NPW4-N-L040-UNV-DM-C40-AF-PP
(QTY=1) NPW2-N-L020-UNV-DM-C40-AF-PP
(QTY=1) NPW6-N-L060-UNV-DM-C40-AF-PP
(QTY=1) NPW3-N-L030-UNV-DM-C40-AF-PP
(QTY=1) NPW1-N-L010-UNV-DM-C40-AF-PP

RENOVA Products Listed on the DLC Qualified Product List (QPL)

See page 4 for complete list.

* Standard "EM" option to be NiCd Battery @ 1000 Lumens @ 90 min. duration (standard). Consult factory for all available options.

** NPW Series Fixtures have a lumen output range from 300 Lumens through 24,000 Lumens depending on length of fixture and driver/board configuration. Consult factory for correct catalog number on all custom configured lighting products.

PRIOR TO REPLACING AN EXISTING FLUORESCENT FIXTURE, PLEASE NOTE THE FOLLOWING:

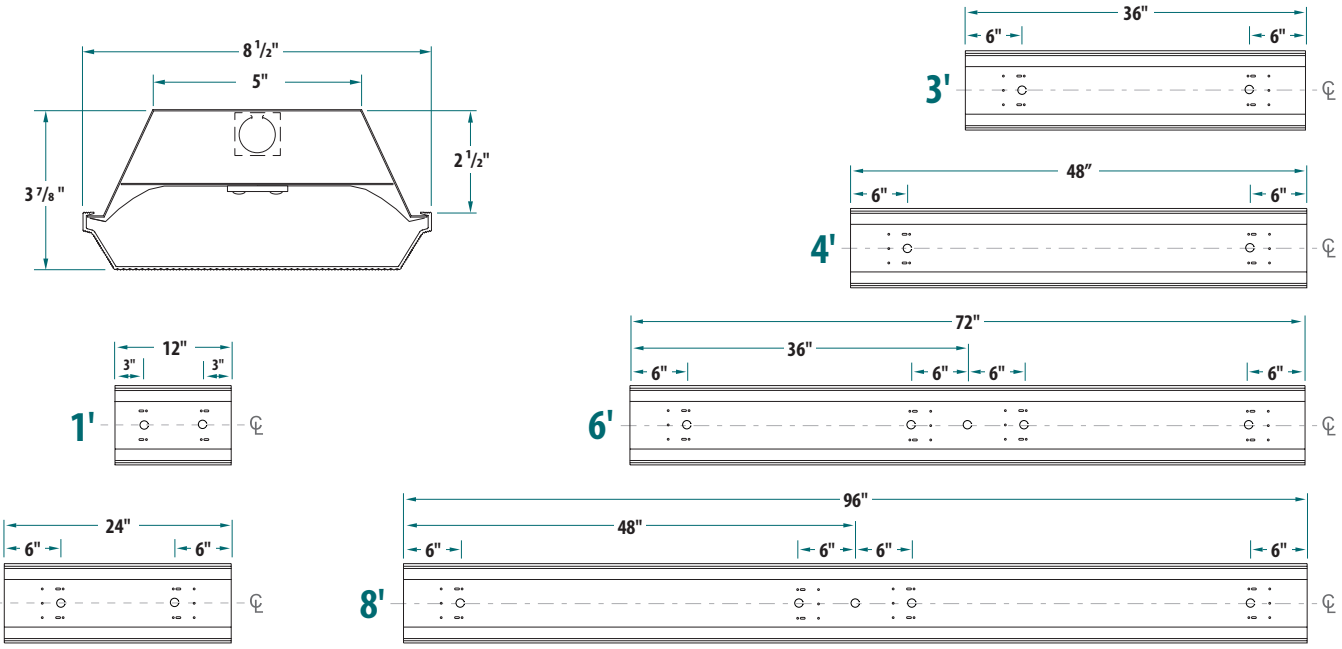
Fluorescent lamps contain small amounts of mercury. Such lamps are labeled "Contains Mercury" and / or with the symbol "Hg." Lamps that contain mercury must be disposed of in accordance with local requirements. Information regarding lamp recycling and disposal can be found at www.lamprecycle.org.

DLC Application Category #7
"Linear Ambient Lighting
of Interior Commercial Spaces"

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified

NPW Cross Section & Fixture Dimensions

Prefix: NPW



Note: Unless otherwise specified, all EKOs are 7/8" diameter.

CONSTRUCTION

- Precision die-formed from code-gauge cold rolled steel.
- Mechanically fastened (standard – when ordered as "PP" under "Housing Color / Finish" in the ordering guide.
- Resistance (spot) welded construction is optional.
- Consult factory for all options or any modifications needed.

FINISH

- Housing
  - High Reflectance Gloss White polyester powder coat baked enamel. "PP" indicates White pre-paint (pop-riveted) construction. "GW" indicates Gloss White post paint (spot-welded) construction.
- Reflector/Optics
  - High Reflectance White polyester powder coat baked enamel for extreme durability and superior optical efficiency.

LED's/OPTICS

- High performance LED boards manufactured specifically for interior lighting. LED boards feature the latest mid-power LEDs for maximum performance, efficiency and longevity.
- Standard color temperatures offered are 3500K and 4000K. Consult factory for all other color temperature options. 80 CRI (Minimum). RoHS Compliant.
- Always consult factory for the latest developments and improvements concerning LEDs and Optics.

DRIVERS

- Electronic, high efficiency, programmable, linear, constant current type. Universal voltage 120v–277v (Standard)
- Features include constant lumen maintenance, end of life indication and LED thermal protection.
- 0-10v dimmable. 10%–100% dimming (Standard) / 1%–100% dimming (Optional).
- Factory programmed drive current, Dim to Off function, Soft Start function.
- Step-Dim and Line Voltage Dimming Drivers are optional.
- Auxiliary output (Optional) used to power various sensors / wireless modules.
- Suitable for dry and damp locations.
- UL/CUL Class 2 Recognized, RoHS Compliant.

LENS (DIFFUSER)

- Extruded, clear, 100% virgin acrylic, linear ribbed with pattern 12 prismatic embossment (Standard).
- 30% DR additive used to increase resistance to breakage (Optional).
- Optional frosted lens / diffuser manufactured from extruded, 100% virgin acrylic & high light transmission / LED diffusing polymer featuring linear ribbed pattern, which provides a clean, aesthetic architectural look.

MOUNTING

- Fixtures are designed to be surface mounted, or suspended using pendant, aircraft cable, or jack chain. Consult factory for all other special mounting conditions.

ELECTRICAL

- Surface Mount Fixtures are UL/CUL listed and labeled for dry/damp locations.
- LM80 performance for 50,000+ hours
- Bi-Level dimming option allows 50% power for compliance with common energy codes.
- Driver disconnect provided where required to comply with US & Canadian codes.

QUALITY CONTROL

- All fixtures are designed, fabricated, assembled, tested, packaged and shipped from RENOVA's manufacturing facility in Mansfield, MA (USA).

WARRANTY

- 5-year limited warranty. Please refer to RENOVA's website at www.renova.com/sales/warranties for the latest warranty terms and conditions.

NOTES:

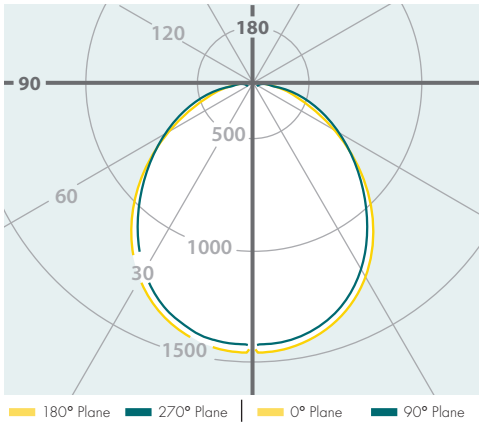
LED Dimming Drivers have adjustable output capability. A wide range of input watts/lumen output can be adjusted up or down on all models to suit a particular application. Always consult factory for the latest information.

Photometric data, IES files and all other information is available on request.

RENOVA products are constantly being improved; therefore the information shown is subject to change without notice. Always consult your lighting representative or RENOVA Lighting Systems, Inc. for the latest information.

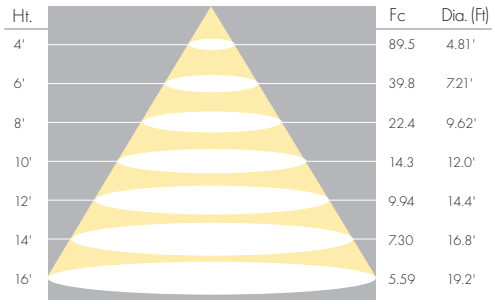
Catalog #: NPW4-N-L037-UNV-DM-C40-AF-XX-XX
Photometric Test Report #: 11201679-1231475
Delivered Lumens: 3738
Efficacy (Lumens/Watt): 137.8
Power: 27.13w @ 120 VAC
Power Factor: 0.996
Current THD: 5.72%
CRI: 83.7
CCT: 3988 K
LED Life: 50,000+ hrs

Candela Distribution Polar Plot



Spacing/Mounting Height: 1.22
SC (Along): 1.22 SC (Across): 1.22

Cone of Light Tabulation



Utilization of Lumens - Zonal Cavity Method

Effective Floor Cavity Reflectance 20%

Ceiling Cavity Reflectance	80				70				50		
Wall Reflectance	70	50	30	10	70	50	30	10	50	30	10
Room Cavity Ratio (RCR)	** Values are expressed as Lumens delivered to the task surface **										
0	4428	4428	4428	4428	4315	4315	4315	4315	4103	4103	4103
1	4042	3863	3703	3558	3931	3769	3624	3491	3594	3474	3365
2	3687	3382	3130	2918	3580	3304	3073	2876	3157	2963	2796
3	3371	2984	2684	2445	3271	2918	2641	2417	2794	2558	2363
4	3095	2655	2333	2087	3003	2600	2300	2068	2495	2235	2030
5	2853	2382	2052	1809	2769	2335	2026	1795	2246	1975	1767
6	2640	2151	1823	1588	2563	2111	1802	1577	2035	1761	1556
7	2452	1956	1635	1409	2383	1922	1617	1401	1857	1584	1385
8	2286	1789	1477	1262	2223	1760	1463	1256	1703	1435	1243
9	2138	1646	1344	1140	2081	1620	1332	1135	1571	1308	1124
10	2007	1521	1230	1037	1955	1499	1220	1032	1456	1200	1024

Average Luminance (cd/m²)

Horizontal Angle (Degrees)

Angle	Along	45.0	Across
0	5604	5604	5604
45	4542	3953	3797
55	3869	3309	3257
65	3143	2711	2822
75	2349	2165	2446
85	1335	1608	2052

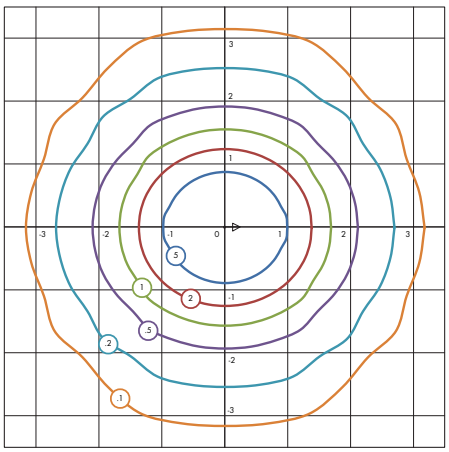
Zonal Lumen Summary

Zone	Lumens	% Luminaire
0-30	1093	29.2%
0-40	1752	46.9%
0-60	2918	78.1%
0-90	3648	97.6%
40-90	1896	50.8%
60-90	730	19.5%
90-180	90	2.4%
0-180	3738	100.0%

Luminaire Efficacy (Lumens Per Watt): 139.1

Horizontal Footcandles

Mounting Height = 8'-0' A.F.F.
Maximum Calculated Value = 18.43 Fc



Grid Lines in Units of Mounting Height

5 fc | 2 fc | 1 fc | .5 fc | .2 fc | .1 fc

NPW Fixtures Listed on the DLC Qualified Products List (QPL)

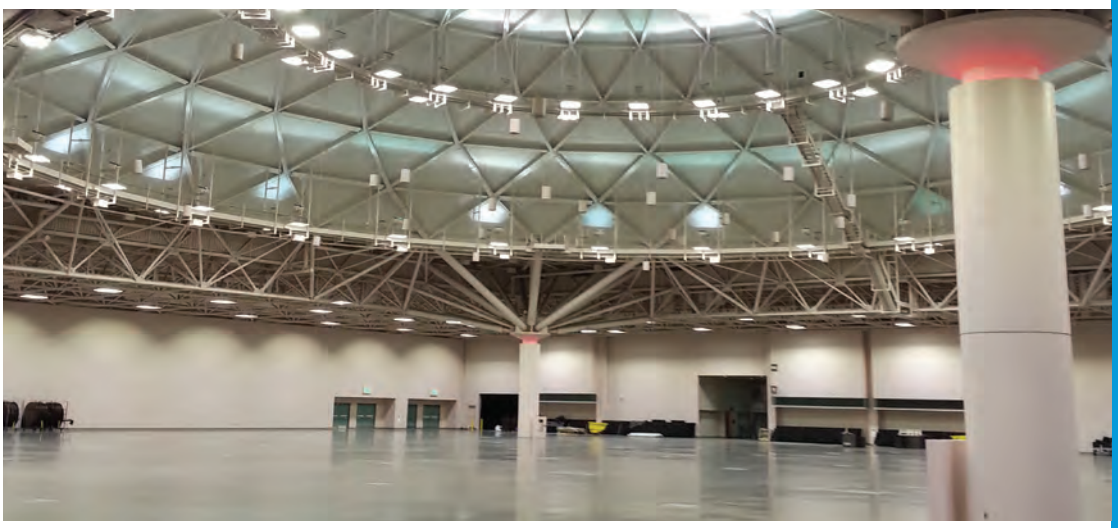
RENOVA Catalog Number	Delivered Lumens	Input Watts	Lumens per Watt	DLC – QPL Classification
NPW2-N-L015-UNV-DM-C35-AP-xx-xx	1469	11.62	126.41	Premium
NPW2-N-L015-UNV-DM-C35-AF-xx-xx	1464	11.47	127.63	Premium
NPW2-N-L015-UNV-DM-C40-AP-xx-xx	1488	11.77	126.42	Premium
NPW2-N-L015-UNV-DM-C40-AF-xx-xx	1483	11.77	125.99	Premium

RENOVA Catalog Number	Delivered Lumens	Input Watts	Lumens per Watt	DLC – QPL Classification
NPW4-N-L015-UNV-DM-C35-AP-xx-xx	1505	12.02	125.24	Premium
NPW4-N-L015-UNV-DM-C35-AF-xx-xx	1523	12.02	126.81	Premium
NPW4-N-L015-UNV-DM-C40-AP-xx-xx	1544	12.02	128.53	Premium
NPW4-N-L015-UNV-DM-C40-AF-xx-xx	1562	12.02	130.03	Premium
NPW4-N-L020-UNV-DM-C35-AP-xx-xx	2067	15.35	134.71	Premium
NPW4-N-L020-UNV-DM-C35-AF-xx-xx	2092	15.35	136.29	Premium
NPW4-N-L020-UNV-DM-C40-AP-xx-xx	2122	15.35	138.25	Premium
NPW4-N-L020-UNV-DM-C40-AF-xx-xx	2146	15.35	139.86	Premium
NPW4-N-L030-UNV-DM-C35-AP-xx-xx	3048	22.17	137.50	Premium
NPW4-N-L030-UNV-DM-C35-AF-xx-xx	3084	22.17	139.11	Premium
NPW4-N-L030-UNV-DM-C40-AP-xx-xx	3128	22.17	141.11	Premium
NPW4-N-L030-UNV-DM-C40-AF-xx-xx	3164	22.17	142.76	Premium
NPW4-N-L040-UNV-DM-C35-AP-xx-xx	3971	29.52	134.54	Premium
NPW4-N-L040-UNV-DM-C35-AF-xx-xx	4018	29.52	136.11	Premium
NPW4-N-L040-UNV-DM-C40-AP-xx-xx	4075	29.52	138.07	Premium
NPW4-N-L040-UNV-DM-C40-AF-xx-xx	4123	29.52	139.68	Premium

RENOVA Catalog Number	Delivered Lumens	Input Watts	Lumens per Watt	DLC – QPL Classification
NPW8-N-L030-UNV-DM-C35-AP-xx-xx	3235	21.98	147.19	Premium
NPW8-N-L030-UNV-DM-C35-AF-xx-xx	3273	21.98	148.91	Premium
NPW8-N-L030-UNV-DM-C40-AP-xx-xx	3320	21.98	151.05	Premium
NPW8-N-L030-UNV-DM-C40-AF-xx-xx	3358	21.98	152.82	Premium
NPW8-N-L040-UNV-DM-C35-AP-xx-xx	4235	29.03	145.90	Premium
NPW8-N-L040-UNV-DM-C35-AF-xx-xx	4285	29.03	147.61	Premium
NPW8-N-L040-UNV-DM-C40-AP-xx-xx	4346	29.03	149.73	Premium
NPW8-N-L040-UNV-DM-C40-AF-xx-xx	4397	29.03	151.48	Premium
NPW8-N-L060-UNV-DM-C35-AP-xx-xx	6195	43.66	141.91	Premium
NPW8-N-L060-UNV-DM-C35-AF-xx-xx	6268	43.66	143.56	Premium
NPW8-N-L060-UNV-DM-C40-AP-xx-xx	6358	43.66	145.63	Premium
NPW8-N-L060-UNV-DM-C40-AF-xx-xx	6432	43.66	147.33	Premium
NPW8-N-L080-UNV-DM-C35-AP-xx-xx	8029	59.00	136.09	Premium
NPW8-N-L080-UNV-DM-C35-AF-xx-xx	8123	59.00	137.68	Premium
NPW8-N-L080-UNV-DM-C40-AP-xx-xx	8239	59.00	139.66	Premium
NPW8-N-L080-UNV-DM-C40-AF-xx-xx	8336	59.00	141.29	Premium

ESSENTIALS SERIES

The award-winning Flex Lighting Solutions Essentials family of LED fixtures provide superior optical performance, quality and versatility for low and high bay applications. With industry-leading fixture efficacy of up to 176 lm/W and up to 80% lower power consumption compared to traditional lighting, Flex Lighting Solutions' Essentials Series LED low-bays and high-bays are designed to provide you with the lowest total cost of ownership (TCO).



- » Multiple lumen options (7,000-70,000)
- » 4000K or 5000K CCT standard
- » Clear and frosted polycarbonate lenses available
- » Aisle lighter distribution available
- » Supports 120–480V inputs
- » Cable, stem or surface mounting options available
- » 95% Initial Light Output at 5 Years*
- » 85% Initial Light Output at 10 Years*
- » Ambient temperature:** -40°C (-40°F) to 55°C (131°F)
- » 5-Year standard, up to 10-year optional warranty

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
7000	6862	44	ES3P-2MS	155
	7040	51	ES3V-2MS	137
12000-14000	12119	69	ES3PE-6MS	176
	13201	98	ES3PH-2MS	135
	13521	86	ES3P-4MS	158
	13521	86	ES3P-2M	158
	14039	100	ES3V-4MS	141
	14039	100	ES3V-2M	141
17000-20000	17125	132	ES3VH-4MS	130
	17154	113	ES3PH-4MS	152
	20838	130	ES3P-6MS	161
	20880	146	ES3V-6MS	143

Nominal Lumens	Lumens[1]	Watt	Model	Efficacy
24000-28000	25031	190	ES3VU-6MS	132
	25167	184	ES3PK-4MS	137
	25918	170	ES3PU-6MS	152
	27042	171	ES3P-4M	158
	28078	200	ES3V-4M	141
35000-42000	35635	244	ES3PH-6MS	146
	40186	280	ES3PU-4M	143
	41676	259	ES3P-6M	161
	41759	293	ES3V-6M	143
48000-50000	50344	367	ES3VU-6M	137
	51835	341	ES3PU-6M	152
70000	71270	489	ES3PH-6M	146

[1] Typical at 277V (LV) and 77°F (25°C), 5000CCT, Clear Lens, +/-7%. Typical CRI80+. Frosted Lens Multiplier is .94, 4000K Multiplier is .92, Aisle Lens Multiplier is .91.

* Based on 24/7 operation. Standard models (P, V, E). H and U models may have decreased performance.

** MBR fixtures Max Temp 5°C less, typical. Max: 50°C (122°F) for ES3PH-6M, ES3PH-6MS and ES3PH-2MS. EMB fixtures 32°F to 122°F (0°C to 50°C). Temperatures below -20° have limited switch cycles, consult factory.

Ordering Example:

ES3P-A-2MS-50-WIDE-CL-LV-MBR-10V-OCCN-CORDN-EMBN

Series-Compliance-Model

ES3P-A-2MS (6862 lm, 44W)	**ES3V-A-4MS** (14039 lm, 100W)	**ES3VU-A-6MS** (25031 lm, 190W)	**ES3PU-A-4M** (40186 lm, 280W)
ES3V-A-2MS (7040 lm, 51W)	**ES3V-A-2M** (14039 lm, 100W)	**ES3PK-A-4MS** (25167 lm, 184W)	**ES3P-A-6M** (41676 lm, 259W)
ES3PE-A-6MS (12119 lm, 69W)	**ES3VH-A-4MS** (17125 lm, 132W)	**ES3PU-A-6MS** (25918 lm, 170W)	**ES3V-A-6M** (41759 lm, 293W)
ES3PH-A-2MS (13201 lm, 98W)	**ES3PH-A-4MS** (17154 lm, 113W)	**ES3P-A-4M** (27042 lm, 171W)	**ES3VU-A-6M** (50344 lm, 367W)
ES3P-A-4MS (13521 lm, 86W)	**ES3P-A-6MS** (20838 lm, 130W)	**ES3V-A-4M** (28078 lm, 200W)	**ES3PU-A-6M** (51835 lm, 341W)
ES3P-A-2M (13521 lm, 86W)	**ES3V-A-6MS** (20880 lm, 146W)	**ES3PH-A-6MS** (35635 lm, 244W)	**ES3PH-A-6M** (71270 lm, 489W)

Color Temp[1]

40
4000K

50
5000K

Other CCT Available upon request

Distribution

Wide
Wide Distribution

Aisle[10]
Aisle Distribution

Lens

CL
Clear Lens

FR
Frosted Lens

Voltage

LV
120-227V

HV
347-480V

Mounting

CRM[6]
Cable Ready (Standard) and has center opening to accept 3/4" stem

MBR[1]
Includes fixture mounting box and bracket for surface mount applications Adds 1.125" to fixture height

HOOK[1]
Field installed mounting kit, includes hook and one pair of levleing cables for hook/loop applications

MBRWT
Includes field installed MBR with factory installed balancing weight

HKWT[1]
Mounting kit including field installed hook and factory installed balancing weight

Dimming

10V
0–10V Interface (standard)

OCC Sensors

OCCN
No Sensor (standard)

OCC8[1]
Occ Sensor, on/off 8' Mounting Height

OCC20[1, 2]
Occ Sensor, on/off 20' Mounting Height

OCC40[1, 2]
Occ Sensor, on/off 40' Mounting Height

OCCDIM8[1, 4, 5]
Occ Sensor, dimmable 8' Mounting Height

OCCDIM20[1, 4, 5]
Occ Sensor, dimmable 20' Mounting Height

OCCDIM40[1, 4, 5]
Occ Sensor, dimmable 40' Mounting Height

DAINT[1, 3, 4,9]
Kit includes Daintree Wireless Fixture

DAINTR[1, 3, 4, 9]
Fixture is Factory Wired for easy integration of Daintree Wireless Controls

Cord & Plug

CORDN
No cord/plug (standard)

C6W[1, 8]
6ft cord, 15A, no plug

C15W[1,8]
15ft cord, 15A, no plug

C515[1, 8]
6ft cord, 15A, straight plug 120V (5-15P)

CL515[1,8]
6ft cord, 15A, locking plug 120V (L5-15P)

CL715[1, 8]
6ft cord, 15A, locking plug 277V (L7-15P)

CL720[1, 8]
6ft cord, 20A, locking plug 277V (L7-20P)

CL2420[1, 8]
6ft cord, 20A, locking plug 347V (L24-20P)

CL820[1,8]
6ft cord, 20A, locking plug 480V (L8-20P)

Battery Backup

EMBN
No emergency battery back-up available (standard)

EMBR[1, 4, 7, 9]
Fixture is EMB-Ready, with test button, indicator lamp and wiring harness factory installed

Option

OPTN
No Option

QDC
Driver Quick Disconnect

PROLV
Fixture installed Surge Protector 120-277V

PROHV
Fixture installed Surge Protector 347-480V

QDLV
Quick Disconnect with LV Surge Protector

QDHV
Quick Disconnect with HV Surge Protector

When submitting for utility incentives and rebates, please use part numbers. Please see our DLC Cross Reference Part Number Guide for mating the Catalog Ordering Code to the corresponding part number at www.flexlightingsolutions.com/pdf/DLC/ES3-DLC-CrossRef.pdf

[1] Optional add-on. See price list for pricing.

[2] Optional add-on for 120-277V only. High voltage options available as special order with longer lead time. Contact factory for pricing and lead time.

[3] Daintree options do not include Daintree ControlScope SoftwareTM, wireless connection hardware/infrastructures, or field commissioning. Consult Daintree for more information and ordering assistance.

[4] Optional add-on available in 120-277V only.

[5] Wireless programmer required for final field setup. See ACCESSORIES.

[6] Optional CABLEKIT ordered separately. See ACCESSORIES.

[7] Field installed EMB KIT must be ordered with this option. See ACCESSORIES.

[8] All cords are 16/3 AWG, 600V, and white.

[9] Consult factory for orders requiring DAINTR and EMBR.

[10] Aisle Lens option available in Clear only

TOTALtUBE G2® T8 BALLAST COMPATIBLE & LINE VOLTAGE | PLUG & PLAY

ORDERING GUIDE

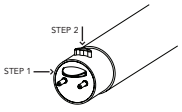
CASE QTY	ENERGY STAR	DLC	PART #	LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
25		●	RPT-TOTALTUBEG2-T8-24IN-XXXXK	1250	9	XXXX	120-277*	7	20W T8 FL	11
25			RPT-TOTALTUBEG2-T8-36IN-XXXXK	1700	12	XXXX	120-277*	7	25W T8 FL	13
25		●	RPT-TOTALTUBEG2-T8-48IN-XXXXK	1700	12	XXXX	120-277*	7	32W T8 FL	20
25		●	RPT-TOTALTUBEMOG2-T8-48IN-XXXXK	1950	14	XXXX	120-277*	7	32W T8 FL	18
25		●	RPT-TOTALTUBEHOG2-T8-48IN-XXXXK	2250	16	XXXX	120-277*	7	32W T8 FL	16
25			RPT-TOTALTUBEG2-T8-24INU-XXXXK	1700	12	XXXX	120-277*	7	40W T8 FL	28

XXXX = 3000, 3500, 4000, or 5000
* 120-277 V AC or Fluorescent ballast

WATTAGE AND LUMEN OUTPUT INFORMATION

PART #	BALLAST TYPE	BALLAST FACTOR	LAMP WATTAGE	SYSTEM WATTAGE*	LAMP LUMENS
RPT-TOTALTUBEG2-T8-24IN	Line Voltage (120-277V AC)	NA	9W	9W	1250LM
	Instant Start	Normal 0.88	9W	12.5W	1250LM
	Instant Start	Low 0.78	7.2W	9.8W	975LM
	Instant Start	High 1.18	12.4W	16.0W	1700LM
RPT-TOTALTUBEG2-T8-36IN	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM
RPT-TOTALTUBEG2-T8-48IN	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM
RPT-TOTALTUBEMOG2-T8-48IN	Line Voltage (120-277V AC)	NA	14W	14W	1950LM
	Instant Start	Normal 0.88	14W	16.9W	1950LM
	Instant Start	Low 0.78	11.2W	13.2W	1520LM
	Instant Start	High 1.18	19.3W	21.7W	2496LM
RPT-TOTALTUBEHOG2-T8-48IN	Line Voltage (120-277V AC)	NA	16W	16W	2250LM
	Instant Start	Normal 0.88	16W	18.4W	2250LM
	Instant Start	Low 0.78	12.8W	14.4W	1750LM
	Instant Start	High 1.18	22.1W	23.6W	2880LM
RPT-TOTALTUBEG2-T8-24INU	Line Voltage (120-277V AC)	NA	12W	12W	1700LM
	Instant Start	Normal 0.88	12W	15W	1700LM
	Instant Start	Low 0.78	9.6W	11.7W	1310LM
	Instant Start	High 1.18	16.6W	19.2W	2150LM

* Wattage is calculated by measuring the average system wattage for a single LED tube including ballast. Average system wattage was measured at 120V and 277V with multiple ballasts from Philips, Sylvania, OSRAM, GE, Keystone, Sunpark, Howard. See table with actual test results for more detailed information on performance with specific ballasts.



The SMARTSENSE®-TLED Switch is designed to allow the LED tube to be installed into a fixture wired for double sided line voltage power. The switch ensures that no electricity is able to flow from one end of the tube to the other before all 4 switches are pressed in. Wiring the fixture to double sided line voltage power (opposed to single sided) ensures that if maintenance personnel ever attempts to reinstall a fluorescent lamp into the sockets wired for line voltage, the fluorescent lamp will simply not illuminate. There are no safety concerns.

RemPhos TECHNOLOGIES

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90 Holten Street • Danvers, MA USA • sales@remphos.com

TOUGHDRUM®

DURABLE AND BEAUTIFUL LED FIXTURE | POWERED BY OUR LEDCR®

Don't let its good looks fool you. Same rugged quality as the outdoor drum, with beautiful black anodized trim. The fixture is designed to safely and quickly replace any existing incandescent or fluorescent fixture. Includes all of the mounting hardware and electrical connections required. Optional integrated occupancy sensor dims fixture to low energy mode when space is unoccupied.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

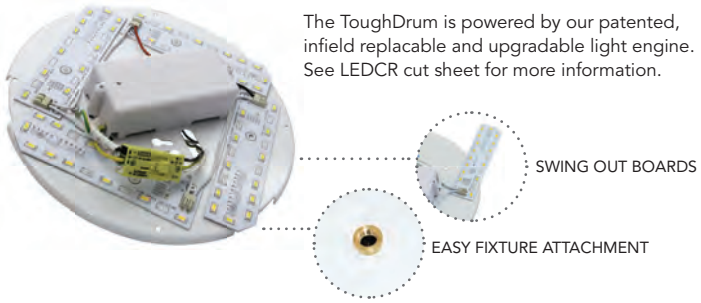
MANUFACTURER	MODEL NUMBER	SIZE	LUMENS	COLOR TEMP	OPTIONS
RPT	TOUGHDRUM	13IN			
			1600LM 2200LM	3000K* 4000K	OCC HI/LO VARIABLE OCCUPANCY SENSOR 10VDIM 0-10V DIMMABLE EMG EMERGENCY BATTERY BACKUP 120 LVD TRIAC/PHASE DIMMABLE 277 LVD TRIAC/PHASE DIMMABLE

ORDERING EXAMPLE

RPT-TOUGHDRUM-13IN-1600LM-3000K-OCC

* 3000K part number can be used for 3000-3500K

LEDCR LIGHT ENGINE

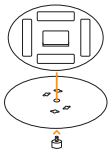


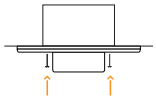
The ToughDrum is powered by our patented, infield replacable and upgradable light engine. See LEDCR cut sheet for more information.

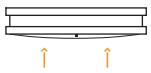
INSTALLATION GUIDE

1. 

Turn off power to the fixture.

2. 
Make connections & using provided brass nut, tighten LEDCR plate onto fixture.

3. 
Install LEDCR/fixture base assembly to existing junction box using longer provided screws.

4. 
Install fixture lens, turn on power.

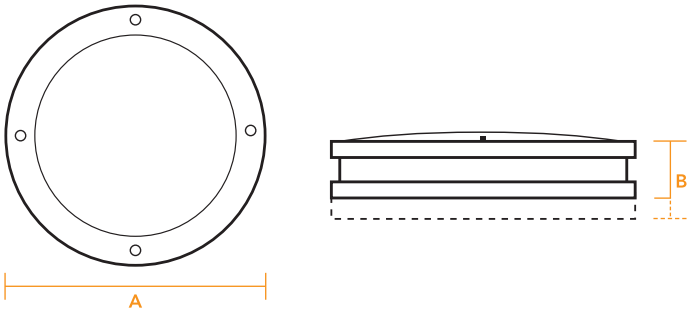
Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC
EFFICACY	>120 LPW @ 4000K
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	85+
WARRANTY	5 years
CERTIFICATIONS	
PERFORMANCE LISTINGS	

May be protected under the following US patents
US 8,106569 | US 8,882,298 | Additional patents pending.

DIMENSIONS



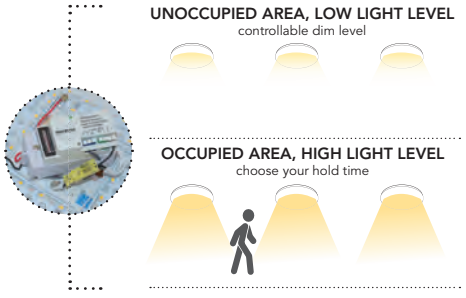
DIMENSIONS (INCHES)	A	B
RPT-TOUGHDRUM-13IN (without optional EMG)	13	3.75
RPT-TOUGHDRUM-13IN (with optional EMG)	13	5.25

TOUGHDRUM® DURABLE AND BEAUTIFUL LED FIXTURE | POWERED BY OUR LEDCR®

ORDERING GUIDE

QUICK SHIP	DLC E*	PART #	LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
	E*	RPT-TOUGHDRUM-13IN-1600LM-3000K	1350	12	3000	120-277	5	3 x 13W CFL (45W)	33
	E*	RPT-TOUGHDRUM-13IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
	DLC E*	RPT-TOUGHDRUM-13IN-1600LM-3000K-OCC	1350	14hi/3lo	3000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
	DLC E*	RPT-TOUGHDRUM-13IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
	E*	RPT-TOUGHDRUM-13IN-2200LM-3000K	1900	18	3000	120-277	5	2 x 26W CFL (54W)	36
	E*	RPT-TOUGHDRUM-13IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
	DLC E*	RPT-TOUGHDRUM-13IN-2200LM-3000K-OCC	1900	20hi/4lo	3000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
	DLC E*	RPT-TOUGHDRUM-13IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo

OPTIONAL FACTORY INSTALLED OCC SENSOR



The LEDCR can be paired with our integral occupancy sensor for maximum energy savings. Unlike traditional passive infrared or ultrasonic occupancy sensors, this high-frequency sensor can be hidden behind the lens of an existing fixture, eliminating the need for external sensors and providing a clean look.

OPTIONAL FACTORY INSTALLED EMG BACKUP

The LEDCR can be paired with an Emergency battery backup. Provides over 90 minutes of safe light levels when power goes out. Battery backup is installed in fixture housing without the need for increasing fixture height.

OPTIONAL TRIM COLORS AND COLLAR

The ToughDrum® housing metal trim can be custom powder coated to virtually color. Also stand-off collar can be provided for mounting of fixture to hard surfaces. Contact us for details.

RemPhos TECHNOLOGIES

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UTILITY DRUM CIRCULAR LED CEILING FIXTURE | POWERED BY OUR LEDCR®

Perfect for hallways, stairwells and entry ways. The fixture is designed to safely and quickly replace any existing incandescent or fluorescent fixture. Includes all of the mounting hardware and electrical connections required. Optional integrated occupancy sensor dims fixture to low energy mode when space is unoccupied.

PROJECT NAME

PART NUMBER

PART NUMBER BUILDER

MANUFACTURER	MODEL NUMBER	SIZE	LUMENS	COLOR TEMP	OPTIONS
RPT	DRUM				
		11IN	900LM	3000K*	**OCC** HI/LO VARIABLE OCCUPANCY SENSOR
		14IN	1600LM	4000K	**10VDIM** 0-10V DIMMABLE
			2200LM		**EMG** EMERGENCY BATTERY BACKUP
			3000LM		**120 LVD** TRIAC/PHASE DIMMABLE
					277 LVD TRIAC/PHASE DIMMABLE

ORDERING EXAMPLE

RPT-DRUM-11IN-900LM-3000K-OCC

* 3000K part number can be used for 3000-3500K

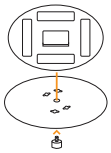
LEDCR LIGHT ENGINE

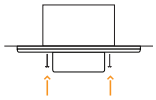
The Designer Drum is powered by our patented, infield replacable and upgradable light engine. See LEDCR cut sheet for more information.

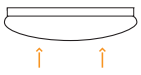
INSTALLATION GUIDE

1. 

Turn off power to the fixture.

2. 
Make connections & using provided brass nut, tighten LEDCR plate onto fixture.

3. 
Install LEDCR/fixture base assembly to existing junction box using longer provided screws.

4. 
Install fixture lens, turn on power.

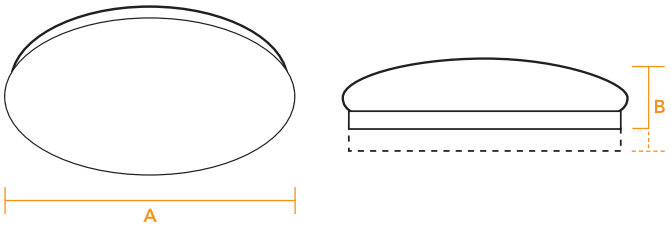
Simplified instructions. Reference full installation guide for more details. Only qualified personnel should perform installation.

QUICK SPECS

INPUT VOLTAGE	120-277V AC
EFFICACY	>120 LPW @ 4000K
OPERATING TEMP	-30˚C to 45˚C
MAX CASE TEMP	50˚C
POWER FACTOR/THD	>0.90 Power Factor, THD<10%
CRI	85+
WARRANTY	5 years
CERTIFICATIONS	
PERFORMANCE LISTINGS	

May be protected under the following US patents
US 8,106569 | US 8,882,298 | Additional patents pending.

DIMENSIONS



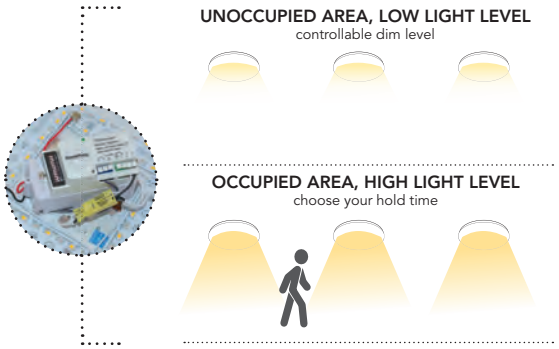
DIMENSIONS (INCHES)	A	B
RPT-DRUM-11IN (without optional EMG)	11	3.5
RPT-DRUM-11IN (with optional EMG)	11	5
RPT-DRUM-14IN (without optional EMG)	14	3.5
RPT-DRUM-14IN (with optional EMG)	14	5

UTILITY DRUM CIRCULAR LED CEILING FIXTURE | POWERED BY OUR LEDCR®

ORDERING GUIDE

QUICK SHIP	DLC E*	PART #	FIXTURE LUMEN OUTPUT (LM)	WATTAGE (W)	CCT (K)	VOLTAGE RANGE (V AC)	WARRANTY (YRS)	TRADITIONAL EQUIVALENT	WATTS SAVED (W)
X	E*	RPT-DRUM-11IN-900LM-3000K	710	7	3000-3500	120-277	5	2 x CFL (30W)	23
	E*	RPT-DRUM-11IN-900LM-4000K	760	7	4000	120-277	5	2 x 13W CFL (30W)	23
X	E*	RPT-DRUM-11IN-1600LM-3000K	1250	12	3000-3500	120-277	5	3 x 13W CFL (45W)	33
X	DLC/E*	RPT-DRUM-11IN-1600LM-3000K-OCC	1250	14hi/3lo	3000-3500	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-11IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
X	DLC/E*	RPT-DRUM-11IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-11IN-2200LM-3000K	1800	18	3000-3500	120-277	5	2 x 26W CFL (54W)	36
X	DLC/E*	RPT-DRUM-11IN-2200LM-3000K-OCC	1800	20hi/4lo	3000-3500	120-277	5	2 x 26W CFL (54W)	34hi/50lo
X	E*	RPT-DRUM-11IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
X	DLC/E*	RPT-DRUM-11IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
X	E*	RPT-DRUM-14IN-1600LM-3000K	1250	12	3000-3500	120-277	5	3 x 13W CFL (45W)	33
X	DLC/E*	RPT-DRUM-14IN-1600LM-3000K-OCC	1250	14hi/3lo	3000-3500	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-14IN-1600LM-4000K	1350	12	4000	120-277	5	3 x 13W CFL (45W)	33
X	DLC E*	RPT-DRUM-14IN-1600LM-4000K-OCC	1350	14hi/3lo	4000	120-277	5	3 x 13W CFL (45W)	31hi/42lo
X	E*	RPT-DRUM-14IN-2200LM-3000K	1800	18	3000-3500	120-277	5	2 x 26W CFL (54W)	36
X	DLC E*	RPT-DRUM-14IN-2200LM-3000K-OCC	1800	20hi/4lo	3000-3500	120-277	5	2 x 26W CFL (54W)	34hi/50lo
X	E*	RPT-DRUM-14IN-2200LM-4000K	1900	18	4000	120-277	5	2 x 26W CFL (54W)	36
X	E*	RPT-DRUM-14IN-2200LM-4000K-OCC	1900	20hi/4lo	4000	120-277	5	2 x 26W CFL (54W)	34hi/50lo
	E*	RPT-DRUM-14IN-3000LM-3000K	2400	27	3000-3500	120-277	5	3 x 26W CFL (80W)	53
	E*	RPT-DRUM-14IN-3000LM-4000K	2500	27	4000	120-277	5	3 x 26W CFL (80W)	53

OPTIONAL FACTORY INSTALLED OCC SENSOR



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OPTIONAL FACTORY INSTALLED EMG BACKUP

The LEDCR can be paired with an Emergency battery backup. Provides over 90 minutes of safe light levels when power goes out.

RemPhos TECHNOLOGIES

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OSQ Series

OSQ™ LED Area/Flood Luminaire – Medium

Product Description

The OSQ™ Area/Flood luminaire blends extreme optical control, advanced thermal management and modern, clean aesthetics. Built to last, the housing is rugged cast aluminum with an integral, weathertight LED driver compartment. Versatile mounting configurations offer simple installation. Its slim, low-profile design minimizes wind load requirements and blends seamlessly into the site providing even, quality illumination. 'A' and 'B' Input power designators are a suitable upgrade for HID applications up to 250 Watt. 'J' and 'K' Input power designators are a suitable upgrade for HID applications up to 400 Watt.

Applications: Parking lots, walkways, campuses, car dealerships, office complexes, and internal roadways

Performance Summary

NanoOptic® Precision Delivery Grid™ optic

Made in the U.S.A. of U.S. and imported parts

Initial Delivered Lumens: Up to 17,191

Efficacy: Up to 136 LPW

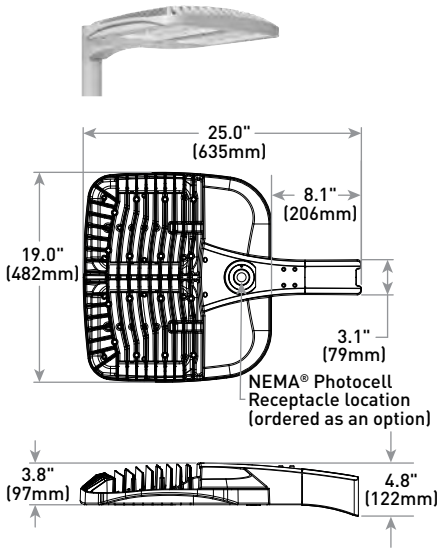
CRI: Minimum 70 CRI (4000K & 5700K; 3000K asymmetric optics); 80 CRI (3000K symmetric optics)

CCT: 3000K (+/- 300K), 4000K (+/- 300K), 5700K (+/- 500K)

Limited Warranty†: 10 years on luminaire/10 years on Colorfast DeltaGuard® finish

†See http://lighting.cree.com/warranty for warranty terms

DA Mount



Weight
26.5 lbs. (12kg)

Accessories

Field-Installed	
Backlight Shield OSQ-BLSMF – Front facing optics OSQ-BLSMR – Rotated optics	**Hand-Held Remote** XA-SENSREM - For successful implementation of the programmable multi-level option, a minimum of one hand-held remote is required

Ordering Information

Fully assembled luminaire is composed of two components that must be ordered separately:
Example: **Mount:** OSQ-AASV + **Luminaire:** OSQ-A-NM-2ME-A-40K-UL-SV

Mount (Luminaire must be ordered separately)			
OSQ-			
OSQ-AA Adjustable Arm **OSQ-DA** Direct Arm	**Color Options:**	**SV** Silver **BK** Black	**BZ** Bronze **WH** White

Luminaire (Mount must be ordered separately)

OSQ	A	NM						
Product	**Version**	**Mounting**	**Optic**	**Input Power Designator**	**CCT**	**Voltage**	**Color Options**	**Options**
OSQ	A	**NM** No Mount	**Asymmetric** **2ME*** Type II Medium **4ME*** Type IV Medium **3ME*** Type III Medium **Symmetric** **5ME** Type V Medium **5SH** Type V Short **WSN** Wide Sign **15D** 15° Flood **25D** 25° Flood **40D** 40° Flood **60D** 60° Flood	**A** 112W **J** 168W **B** 86W **K** 130W	**30K** 3000K **40K** 4000K **57K** 5700K	**UL** Universal 120-277V **UH** Universal 347-480V	**BK** Black **BZ** Bronze **SV** Silver **WH** White	**DIM** 0-10V Dimming - Control by others - Refer to Dimming spec sheet for details - Can't exceed wattage of specified input power designator **F** Fuse - When code dictates fusing, use time delay fuse **ML** Multi-Level - Refer to ML spec sheet for details - High: 100%, Low: 30% - Available with UL voltage only - Intended for downlight applications at 0° tilt **PML** Programmable Multi-Level, 20-40' Mounting Height - Refer to PML spec sheet for details - Available with UL voltage only - Intended for downlight applications at 0° tilt **PML2** Programmable Multi-Level, 10-30' Mounting Height - Refer to PML spec sheet for details - Available with UL voltage only - Intended for downlight applications at 0° tilt **Q9** Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details **R** NEMA® Photocell Receptacle - Intended for downlight applications with maximum 45° tilt - 3-pin receptacle per ANSI C136.10 - Photocell and shorting cap by others **RL** Rotate Left - LED and optic are rotated to the left **RR** Rotate Right - LED and optic are rotated to the right

* Available with Backlight Shield when ordered with field-installed accessory (see table above)

Rev. Date: V8 05/23/2016

US: lighting.cree.com/lighting T (800) 236-6800 F (262) 504-5415

Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

Product Specifications

CONSTRUCTION & MATERIALS

- Slim, low profile design minimizes wind load requirements
- Luminaire housing is rugged die cast aluminum with an integral, weathertight LED driver compartment and high performance heat sink
- Convenient interlocking mounting method on direct arm mount. Mounting adaptor is rugged die cast aluminum and mounts to 3-6" (76-152mm) square or round pole, secured by two 5/16-18 UNC bolts spaced on 2" (51mm) centers
- Mounting for the adjustable arm mount adaptor is rugged die cast aluminum and mounts to 2" (51mm) IP, 2.375" (60mm) O.D. tenon
- Adjustable arm mount can be adjusted 180˚ in 2.5˚ increments
- Designed for uplight and downlight applications
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Silver, bronze, black, and white are available
- **Weight:** 26.5 lbs. (12kg)

ELECTRICAL SYSTEM

- **Input Voltage:** 120-277V or 347-480V, 50/60Hz, Class 1 drivers
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used
- **10V Source Current:** 0.15mA

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- Suitable for wet locations
- Enclosure rated IP66 per IEC 60529 when ordered without R option
- Consult factory for CE Certified products
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets FCC Part 15 , Subpart B, Class A standards for conducted and radiated emissions
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA
- DLC qualified when ordered with asymmetric optics with 40K or 57K. Please refer to www.designlights.org/QPL for most current information
- RoHS compliant. Consult factory for additional details

Electrical Data*

Input Power Designator	Optic	System Watts 120-480V	Total Current					
			120V	208V	240V	277V	347V	480V
A	Asymmetric	112	0.97	0.56	0.49	0.43	0.34	0.25
J		168	1.47	0.85	0.74	0.64	0.50	0.36
B	Symmetric	86	0.73	0.43	0.37	0.32	0.25	0.19
K		130	1.09	0.65	0.56	0.49	0.38	0.28

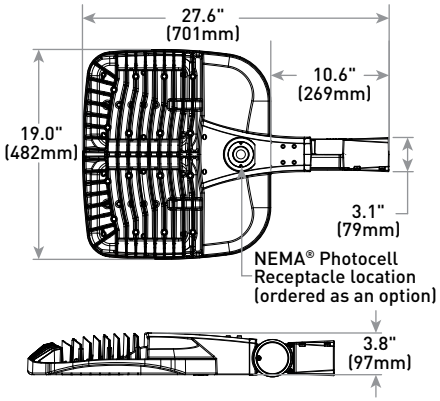
* Electrical data at 25˚C (77˚F). Actual wattage may differ by +/- 10% when operating between 120-480V +/-10%

Recommended OSQ Series Lumen Maintenance Factors (LMF)[1]

Ambient	Optic	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Projected[2] LMF	100K hr Calculated[3] LMF
5˚C (41˚F)	Asymmetric	1.04	0.99	0.93	0.89	0.84
	Symmetric	1.05	1.00	0.96[3]	0.92[3]	0.88[3]
10˚C (50˚F)	Asymmetric	1.03	0.98	0.93	0.88	0.83
	Symmetric	1.04	0.99	0.95[3]	0.91[3]	0.87[3]
15˚C (59˚F)	Asymmetric	1.02	0.97	0.92	0.87	0.82
	Symmetric	1.02	0.98	0.94[3]	0.90[3]	0.87[3]
20˚C (68˚F)	Asymmetric	1.01	0.96	0.91	0.86	0.82
	Symmetric	1.01	0.96	0.92[3]	0.88[3]	0.85[3]
25˚C (77˚F)	Asymmetric	1.00	0.95	0.90	0.85	0.81
	Symmetric	1.00	0.95	0.91[3]	0.88[3]	0.84[3]

[1] Lumen maintenance values at 25˚C (77˚F) are calculated per TM-21 based on LM-80 data and in-situ luminaire testing
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT] i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ([DUT] i.e. the packaged LED chip)

AA Mount



Weight
26.5 lbs. (12kg)

OLWX1 LED
LED Wall Luminaire

Catalog Number

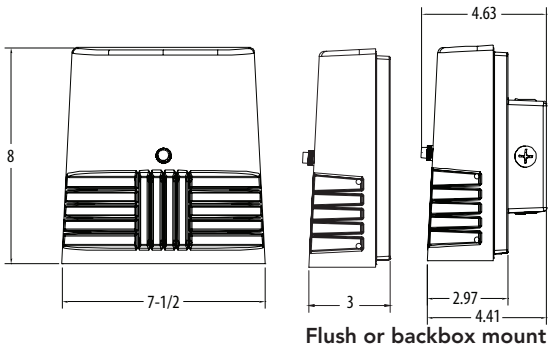
Notes

Type

Hit the Tab key or mouse over the page to see all interactive elements.

Specifications

Width:	7-1/2" *(19 cm)*
Height:	8" *(20.3 cm)*
Depth:	3" *(7.62 cm)*
Weight:	5 lbs *(2.27kg)*



Flush or backbox mount

Introduction

As versatile as it is efficient, the OLWX1 is designed to replace up to 250W metal halide while saving over 87% in energy costs. It combines multiple mounting options with the latest generation of LEDs for a wall pack luminaire that converts to a whole lot more. Whether you are mounting it to a recessed junction box, conduit/through wiring, as an up light, as a down light, or as a flood light – the OLWX1 has you covered.

Ordering Information

EXAMPLE: OLWX1 LED 20W 50K

OLWX1 LED											
Series	**Performance Package**		**Color Temperature**		**Voltage**		**Controls**		**Finish**	
OLWX1 LED	13W	13 watts	40K	4000 K [1]	(blank)	MVOLT [2]	(blank)	None	(blank)	Dark bronze
	20W	20 watts	50K	5000 K	120	120V [3]	PE	120V button photocell [1,3]		
	40W	40 watts			347	347V				

Accessories

Ordered and shipped separately.

OLWX1TS	Slipfitter – size 1
OLWX1YK	Yoke – size 1
OLWX1THK	Knuckle – size 1

NOTES

1 Not available with 347V option.
2 MVOLT driver operates on any line voltage from 120-277V (50/60Hz).
3 Specify 120V when ordering with photocell (PE option).

FEATURES & SPECIFICATIONS

INTENDED USE

The versatility of the OLWX1 LED combines a sleek, low-profile wall pack design and high-output LEDs to provide an energy efficient, low maintenance LED wall pack suitable for replacing up to 250W metal halide fixtures. Available flood light mounting accessories convert the OLWX1 LED into a highly efficient flood light.

OLWX1 LED is ideal for outdoor applications such as building perimeters, loading areas, driveways and sign and building flood lighting.

CONSTRUCTION

Rugged cast-aluminum housing with textured dark bronze polyester powder paint for lasting durability. Integral heat sinks optimize thermal management through conductive and convective cooling. LEDs are protected behind a glass lens. Housing is sealed against moisture and environmental contaminants (IP65).

OPTICS

High-performance LEDs behind clear glass for maximum light output. Light engines are available in 4000K and 5000K CCTs. See Lighting Facts label and photometry reports for specific fixture performance.

ELECTRICAL

Light engine consists of 1 high-efficiency Chip On Board (COB) LED with integrated circuit board mounted directly to the housing to maximize heat dissipation and promote long life (L73/100,000 hours at 25°C). Electronic drivers have a power factor >90% and THD <20% and a minimum 2.5kV surge rating. Flood light mounting accessories include an additional 6kV surge protection device.

INSTALLATION

Easily mounts to recessed junction boxes with the included wall mount bracket, or for surface mounting and conduit entry - with the included junction box with five 1/2" threaded conduit entry hubs. Flood light mounting accessories (sold separately) include knuckle, integral slipfitter and yoke mounting options. Each flood mount accessory comes with a top visor and vandal guard. Luminaire may be wall or ground mounted in downward or upward orientation.

LISTINGS

UL Listed to U.S. and Canadian safety standards for wet locations. Rated for -40° C minimum ambient. Tested in accordance with IESNA LM-79 and LM-80 standards. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified.

WARRANTY

Five-year limited warranty. Full warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx.

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25°C. Specifications subject to change without notice.

LITHONIA LIGHTING®
One Lithonia Way • Conyers, Georgia 30012 • Phone: 800.279.8041 • Fax: 770.918.1209 • www.lithonia.com

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts.

Fixture Model Number	CCT	System Watts	Lumens	LPW	B	U	G	CRI
OLWX1 LED 13W 40K	4000 K	14 W	1,271	91	1	0	0	>70
OLWX1 LED 13W 50K	5000 K	14 W	1,289	92	1	0	0	>80
OLWX1 LED 20W 40K	4000 K	22 W	1,854	84	1	0	0	>70
OLWX1 LED 20W 50K	5000 K	22 W	1,860	84	1	0	0	>80
OLWX1 LED 40W 40K	4000 K	39 W	4,027	101	2	0	0	>70
OLWX1 LED 40W 50K	5000 K	37 W	4,079	110	2	0	0	>70

Electrical Load

Fixture Model Number	Rated Power (watts)	Input current at given input voltage (amps)				
		120V	208V	240V	277V	347V
OLWX1 LED 13W 40K	14 W	0.12	0.07	0.06	0.06	0.04
OLWX1 LED 13W 50K	14 W	0.12	0.07	0.06	0.06	0.04
OLWX1 LED 20W 40K	22 W	0.20	0.12	0.10	0.09	0.06
OLWX1 LED 20W 50K	22 W	0.20	0.12	0.10	0.09	0.06
OLWX1 LED 40W 40K	39 W	0.37	0.21	0.19	0.16	0.11
OLWX1 LED 40W 50K	37 W	0.37	0.21	0.19	0.16	0.11

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

	0°C	10°C	20°C	25°C	30°C	40°C
13W	1.06	1.03	1.01	1.00	0.99	0.96
20W	1.06	1.04	1.01	1.00	0.99	0.96
40W	1.07	1.04	1.01	1.00	0.99	0.96

Projected LED Lumen Maintenance

Data references the extrapolated performance projections in a **25°C ambient**, based on 10,000 hours of LED testing (tested per IESNA LM-80-08 and projected per IESNA TM-21-11).

To calculate LLF, use the lumen maintenance factor that corresponds to the desired number of operating hours below. For other lumen maintenance values, contact factory.

Operating Hours	0	25,000	50,000	100,000
OLWX1 LED 13W	1.00	0.92	0.85	0.73
OLWX1 LED 20W	1.00	0.92	0.85	0.73
OLWX1 LED 40W	1.00	0.94	0.88	0.79

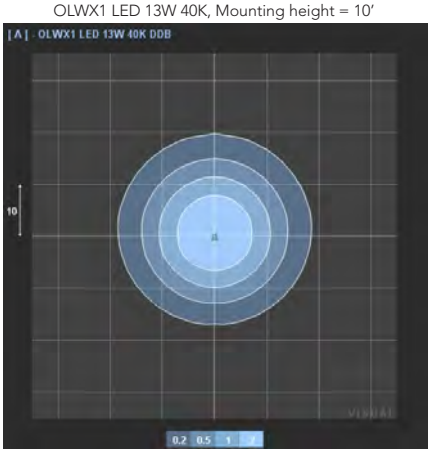
Photometric Diagrams

To see complete photometric reports or download .ies files for this product, visit the Lithonia Lighting OLWX1 LED homepage. Tested in accordance with IESNA LM-79 and LM-80 standards

LEGEND

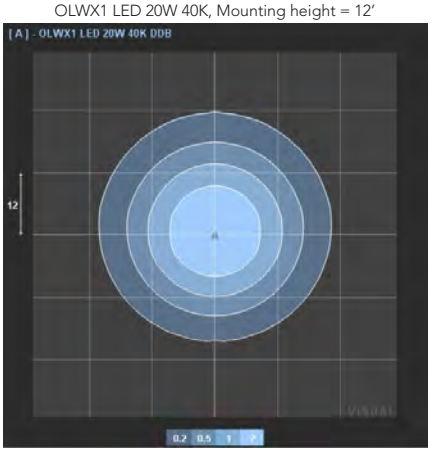
- 0.2 fc
- 0.5 fc
- 1.0 fc
- 2.0 fc

OLWX1 LED 13W 40K, Mounting height = 10'



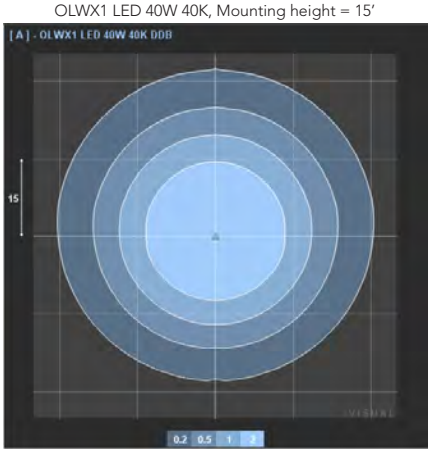
Test No. LTL22697 tested in accordance with IESNA LM-79-08.

OLWX1 LED 20W 40K, Mounting height = 12'



Test No. LTL22696 tested in accordance with IESNA LM-79-08.

OLWX1 LED 40W 40K, Mounting height = 15'



Test No. LTL22695 tested in accordance with IESNA LM-79-08.

Accessories

OLWX1TS
Slipfitter – size 1

OLWX1YK
Yoke – size 1

OLWX1THK
Knuckle – size 1

Top Visor and Vandal Guard included with accessories

VI. Appendix B: Town of Medfield Energy Audits – AECOM

Appendix B1

EVERSOURCE Municipal Program
Custom/Comprehensive Energy Efficiency Projects

Cost/Ben
0.25

Recommendations & Estimated Return On Investment (R.O.I.)

prepared by: AECOM Energy

EVERSOURCE APPLICATION NO: 0
AECOM ENERGY ID NO: MP160053
FACILITY NAME: Medfield Council on Aging
ADDRESS: 1 Ice House Road
CITY/TOWN/ZIP: Medfield, MA 02052
CONTACT: Andrew Seaman
PHONE: 508-906-3013

** Ave. kWh rate: 0.150

DATE: 7/7/2015
AUDITOR: Derrek Brown
AUDITOR PHONE: 617-835-8261
ACCT NO: 0
FID NO/STATUS: 0

	INSTALLATION SITE	DEVICE DESCRIPTION	QTY	Total Cost	EVERSOURCE Incentive	Net Cost of Installation	Total KW Saved	Estimated Exist.Hrs.	Annual kwh Saved	Estimated $$ Saved **	Simple Payback
1	MAIN VESTIBULE	21 WATT LED 6" Recessed Can Retrofit Kit	3	$ 330.11	$ 22.82	$ 307.29	0.04	45	91.3	$13.69	22.4
2	MULTI-PURPOSE ROOM A & B	90 WATT LED RETROKIT	4	$2,846.40	$386.10	$2,460.30	0.66	45	1,544.4	$231.66	10.6
3	MULTI-PURPOSE ROOM A & B	90 WATT LED RETROKIT	6	$4,269.59	$526.50	$3,743.09	0.90	45	2,106.0	$315.90	11.8
4	KITCHEN	44 WATT LED 2x4 Prismatic Fixture	6	$1,196.52	$154.44	$1,042.08	0.26	45	617.8	$92.66	11.2
5	PANTRY	44 WATT LED 2x4 Prismatic Box Fixture	1	$320.96	$11.44	$309.52	0.04	20	45.8	$6.86	45.1
6	ELECTRIC ROOM	16 WATT LED 4' Strip Fixture w/Lens	1	$175.82	$1.82	$174.00	0.01	10	7.3	$1.09	159.3
7	STORAGE	44 WATT LED 2x4 Prismatic Fixture	2	$398.84	$22.88	$375.96	0.09	20	91.5	$13.73	27.4
8	LOBBY	45 WATT LED RETROKIT	3	$1,562.56	$89.51	$1,473.05	0.15	45	358.0	$53.70	27.4
9	LOBBY	45 WATT LED RETROKIT	1	$520.85	$67.28	$453.58	0.12	45	269.1	$40.37	11.2
10	LOBBY	21 WATT LED 6" Recessed Can Retrofit Kit	8	$880.28	$60.84	$819.44	0.10	45	243.4	$36.50	22.4
11	WALL SCONCE	16 WATT LED RETROKIT	10	$1,319.24	$81.90	$1,237.34	0.14	45	327.6	$49.14	25.2
12	LIBRARY	30 WATT LED 2X2 Center Basket Fixture	6	$998.28	$105.30	$892.98	0.18	45	421.2	$63.18	14.1
13	RECEPTION DESK	30 WATT LED 2X2 Center Basket Fixture	6	$998.28	$105.30	$892.98	0.18	45	421.2	$63.18	14.1
14	COPY ROOM	42 WATT LED 2X4 Center Basket Fixture	1	$199.42	$26.91	$172.51	0.05	45	107.6	$16.15	10.7
15	OFFICE A	42 WATT LED 2X4 Center Basket Fixture	2	$398.84	$53.82	$345.02	0.09	45	215.3	$32.29	10.7
16	ROBERTA'S OFFICE	42 WATT LED 2X4 Center Basket Fixture	2	$398.84	$53.82	$345.02	0.09	45	215.3	$32.29	10.7
17	OFFICE B	42 WATT LED 2X4 Center Basket Fixture	2	$398.84	$53.82	$345.02	0.09	45	215.3	$32.29	10.7
18	HALL	21 WATT LED 6" Recessed Can Retrofit Kit	8	$880.28	$60.84	$819.44	0.10	45	243.4	$36.50	22.4
19	BATH VESTIBULE	42 WATT LED 2X4 Center Basket Fixture	1	$199.42	$26.91	$172.51	0.05	45	107.6	$16.15	10.7
20	MENS	44 WATT LED 2x4 Prismatic Box Fixture	3	$962.88	$42.90	$919.98	0.13	25	171.6	$25.74	35.7
21	WOMENS	44 WATT LED 2x4 Prismatic Box Fixture	3	$962.88	$42.90	$919.98	0.13	25	171.6	$25.74	35.7
22	RESTROOM	33 WATT LED 2x2 Prismatic Box Fixture	1	$261.96	$8.78	$253.19	0.03	25	35.1	$5.27	48.1
23	HEALTH OFFICE	42 WATT LED 2X4 Center Basket Fixture	1	$199.42	$23.92	$175.50	0.05	40	95.7	$14.35	12.2
24	ATTIC	16 WATT LED 4' Strip Fixture w/Lens	8	$1,406.56	$14.56	$1,392.00	0.11	10	58.2	$8.74	159.3
25	JANITOR	16 WATT LED 4' Strip Fixture w/Lens	1	$175.82	$2.73	$173.09	0.01	15	10.9	$1.64	105.7
26	CLASSROOM	42 WATT LED 2X4 Center Basket Fixture	3	$598.26	$71.76	$526.50	0.14	40	287.0	$43.06	12.2
27	CRAFT ROOM	42 WATT LED 2X4 Center Basket Fixture	9	$1,794.78	$215.28	$1,579.50	0.41	40	861.1	$129.17	12.2
28	ACTIVITY ROOM	42 WATT LED 2X4 Center Basket Fixture	7	$1,395.94	$167.44	$1,228.50	0.32	40	669.8	$100.46	12.2
29	FRONT DOOR	30 WATT LED Special Fixture	2	$709.06	$52.42	$656.65	0.05	84	209.7	$31.45	20.9
30	EXIT DOORS AROUND BLDG	10W LED A19 27-22K Retrofit	4	$72.69	$65.52	$7.17	0.06	84	262.1	$39.31	0.2
31	FLAG	30 WATT LED Special Fixture	2	$693.72	$141.96	$551.76	0.13	84	567.8	$85.18	6.5
32	PARKING LOT	60 WATT LED ROUND BARE Retrokit	9	$4,800.24	$1,425.06	$3,375.18	1.31	84	5,700.2	$855.04	3.9
33		Lift Rental	1	$619.50		$619.50					
34		Material & Trash Handling	1	$387.04		$387.04					
35		Power source abandoned for FI or CF	76	$582.92		$582.92					
36		Power source abandoned-HID-Interior/Exterior	41	$653.13		$653.13					
37											
38											
39											
40											
41											
42											
43											

	INSTALLATION SITE	DEVICE DESCRIPTION	QTY	Total Cost	EVERSOURCE Incentive	Net Cost of Installation	Total KW Saved	Estimated Exist.Hrs.	Annual kwh Saved	Estimated $$ Saved **	Simple Payback
44											
45											
TOTALS:				**$34,570.17**	**$4,187.46**	**$30,382.71**	**6.23**		**16,749.82**	**$2,512.47**	**12.1**

Appendix B2

EVERSOURCE Municipal Program
Custom/Comprehensive Energy Efficiency Projects

Recommendations & Estimated Return On Investment (R.O.I.)

prepared by: AECOM Energy

Cost/Ben
0.25

EVERSOURCE APPLICATION NO: 0
AECOM ENERGY ID NO: MP160054
FACILITY NAME: Medfield Public Library
ADDRESS: 468 Main Street
CITY/TOWN/ZIP: Medfield, MA 02052
CONTACT: Andrew Seaman
PHONE: 508-906-3013

** Ave. kWh rate: 0.150

DATE: 7/7/2015
AUDITOR: Derrek Brown
AUDITOR PHONE: 617-835-8261
ACCT NO: 0
FID NO/STATUS: 0

	INSTALLATION SITE	DEVICE DESCRIPTION	QTY	Total Cost	EVERSOURCE Incentive	Net Cost of Installation	Total KW Saved	Estimated Exist.Hrs.	Annual kwh Saved	Estimated $$ Saved **	Simple Payback
1	MAIN VESTIBULE	37 WATT LED Special Drum Fixture	1	$ 302.08	$ 79.24	$ 222.85	0.12	53	316.9	$47.54	4.7
2	BOOK RETURN	30 WATT LED 4' Strip Fixture w/Lens	1	$ 178.18	$ 20.67	$ 157.51	0.03	53	82.7	$12.40	12.7
3	RECEPTION DESK	37 WATT LED Special Drum Fixture	4	$ 1,208.32	$ 316.94	$ 891.38	0.46	53	1,267.8	$190.16	4.7
4	RECEPTION DESK	21 WATT LED 6" Recessed Can Retrofit Kit	8	$ 880.28	$ 71.66	$ 808.62	0.10	53	286.6	$42.99	18.8
5	RECEPTION DESK - COVE	4L4' 12W LEDT8/ELEE Low Pwr Lamp & Ballast	8	$ 992.71	$ 341.74	$ 650.96	0.50	53	1,367.0	$205.05	3.2
6	RIGHT SIDE STACKS	35 WATT LED 1X4 Center Basket Fixture	27	$ 4,970.16	$ 465.08	$ 4,505.09	0.68	53	1,860.3	$279.05	16.1
7	RIGHT SIDE STACKS	21 WATT LED 6" Recessed Can Retrofit Kit	9	$ 990.32	$ 80.61	$ 909.70	0.12	53	322.5	$48.37	18.8
8	CUSTODIAN	30 WATT LED 4' Strip Fixture w/Lens	1	$ 178.18	$ 3.90	$ 174.28	0.03	10	15.6	$2.34	74.5
9	WOMENS ROOM	44 WATT LED 2x4 Prismatic Fixture	1	$ 199.42	$ 14.30	$ 185.12	0.04	25	57.2	$8.58	21.6
10	MENS ROOM	44 WATT LED 2x4 Prismatic Fixture	1	$ 199.42	$ 14.30	$ 185.12	0.04	25	57.2	$8.58	21.6
11	LEFT SIDE STACKS	35 WATT LED 1X4 Center Basket Fixture	23	$ 4,233.84	$ 396.18	$ 3,837.67	0.58	53	1,584.7	$237.71	16.1
12	LEFT SIDE STACKS - 6"	21 WATT LED 6" Recessed Can Retrofit Kit	3	$ 330.11	$ 26.87	$ 303.23	0.04	53	107.5	$16.12	18.8
13	STAFF AREA	42 WATT LED 2X4 Center Basket Fixture	4	$ 797.68	$ 126.78	$ 670.90	0.18	53	507.1	$76.07	8.8
14	STAFF OFFICE	42 WATT LED 2X4 Center Basket Fixture	3	$ 598.26	$ 95.08	$ 503.18	0.14	53	380.3	$57.05	8.8
15	STAFF OFFICE	Install Wall Switch Occupancy Sensor with Plate	1	$ 69.62	$ 24.57	$ 45.05	0.13	15	98.3	$14.74	3.1
16	STAFF BREAK ROOM	42 WATT LED 2X4 Center Basket Fixture	3	$ 598.26	$ 95.08	$ 503.18	0.14	53	380.3	$57.05	8.8
17	STAFF BREAK ROOM - 6"	21 WATT LED 6" Recessed Can Retrofit Kit	1	$ 110.04	$ 8.96	$ 101.08	0.01	53	35.8	$5.37	18.8
18	STAFF BREAK ROOM	Install Wall Switch Occupancy Sensor with Plate	1	$ 69.62	$ 28.67	$ 40.96	0.15	15	114.7	$17.20	2.4
19	OUTSIDE STAIRS/REFERENCE	37 WATT LED Special Drum Fixture	3	$ 906.24	$ 237.71	$ 668.54	0.35	53	950.8	$142.62	4.7
20	OUTSIDE STAIRS/REFERENCE	21 WATT LED 6" Recessed Can Retrofit Kit	3	$ 330.11	$ 26.87	$ 303.23	0.04	53	107.5	$16.12	18.8
21	STAIRS	21 WATT LED 6" Recessed Can Retrofit Kit	14	$ 1,540.49	$ 125.40	$ 1,415.09	0.18	53	501.6	$75.24	18.8
22	STAIRS	44 WATT LED 8' Strip Fixture w/Lens	2	$ 598.26	$ 22.05	$ 576.21	0.03	53	88.2	$13.23	43.6
23	REFERENCE DESK	21 WATT LED 6" Recessed Can Retrofit Kit	2	$ 220.07	$ 17.91	$ 202.16	0.03	53	71.7	$10.75	18.8
24	REFERENCE DESK - 6"	21 WATT LED 6" Recessed Can Retrofit Kit	4	$ 440.14	$ 35.83	$ 404.31	0.05	53	143.3	$21.50	18.8
25	REFERENCE SECTION	90 WATT LED RETROKIT	6	$ 4,269.59	$ 570.49	$ 3,699.10	0.83	53	2,282.0	$342.30	10.8
26	REFERENCE OFFICE	4L3' 10.5W LEDT8/ELEE LOW PWR 6' Strip Kit	1	$ 183.45	$ 20.48	$ 162.98	0.05	35	81.9	$12.29	13.3
27	REFERENCE OFFICE	5W LED Candelabra 827-22K Retrofit	2	$ 34.43	$ 31.85	$ 2.58	0.07	35	127.4	$19.11	0.1
28	PERIODICALS	90 WATT LED RETROKIT	3	$ 2,134.80	$ 285.25	$ 1,849.55	0.41	53	1,141.0	$171.15	10.8
29	TOP OF STAIRS	21 WATT LED 6" Recessed Can Retrofit Kit	4	$ 440.14	$ 35.83	$ 404.31	0.05	53	143.3	$21.50	18.8
30	CHECK OUT DESK	27 WATT LED 8" Recessed Can Retrofit Kit	9	$ 955.80	$ 167.43	$ 788.37	0.24	53	669.7	$100.46	7.8
31	STACKS	94 WATT LED PENDANT	10	$ 14,160.00	$ 1,171.30	$ 12,988.70	1.70	53	4,685.2	$702.78	18.5
32	STACKS	27 WATT LED 8" Recessed Can Retrofit Kit	21	$ 2,230.20	$ 390.66	$ 1,839.54	0.57	53	1,562.7	$234.40	7.8
33	CRAFT ROOM	64 WATT LED PENDANT	3	$ 2,832.00	$ 231.50	$ 2,600.50	0.34	53	926.0	$138.90	18.7
34	OFFICE	42 WATT LED 2X4 Center Basket Fixture	2	$ 398.84	$ 47.84	$ 351.00	0.09	40	191.4	$28.70	12.2
35	OFFICE	Install Wall Switch Occupancy Sensor with Plate	1	$ 69.62	$ 16.38	$ 53.24	0.08	15	65.5	$9.83	5.4
36	GIRLS	44 WATT LED 2x4 Prismatic Fixture	1	$ 199.42	$ 14.30	$ 185.12	0.04	25	57.2	$8.58	21.6
37	BOYS	44 WATT LED 2x4 Prismatic Fixture	1	$ 199.42	$ 14.30	$ 185.12	0.04	25	57.2	$8.58	21.6
38	BASEMENT										
39	OUTSIDE ELEVATORS	35 WATT LED 1X4 Center Basket Fixture	5	$ 920.40	$ 86.13	$ 834.28	0.13	53	344.5	$51.68	16.1
40	STACKS	35 WATT LED 1X4 Center Basket Fixture	102	$ 18,776.16	$ 1,756.95	$ 17,019.21	2.55	53	7,027.8	$1,054.17	16.1
41	STACKS	30 WATT LED 2X2 Center Basket Fixture	11	$ 1,830.18	$ 227.37	$ 1,602.81	0.33	53	909.5	$136.42	11.7
42	STACKS - 6"	21 WATT LED 6" Recessed Can Retrofit Kit	2	$ 220.07	$ 17.91	$ 202.16	0.03	53	71.7	$10.75	18.8
43	EQUIPMENT ROOM	27 WATT LED 4' WRAPAROUND	4	$ 708.00	$ 34.32	$ 673.68	0.13	20	137.3	$20.59	32.7

	INSTALLATION SITE	DEVICE DESCRIPTION	QTY	Total Cost	EVERSOURCE Incentive	Net Cost of Installation	Total KW Saved	Estimated Exist.Hrs.	Annual kwh Saved	Estimated $$ Saved **	Simple Payback
44	CONF ROOM	35 WATT LED 2X4 Center Basket Fixture	2	$ 398.84	$ 16.25	$ 382.59	0.05	25	65.0	$9.75	39.2
45	CONF ROOM	Install Wall Switch Occupancy Sensor with Plate	1	$ 69.62	$ 9.10	$ 60.52	0.07	10	36.4	$5.46	11.1
46	STUDY 1	2L4' 12W LEDT8/ELEE Low Pwr Lamp & Ballast	1	$ 76.91	$ 11.38	$ 65.53	0.04	25	45.5	$6.83	9.6
47	ELEVATOR MACHINE	30 WATT LED 4' Strip Fixture w/Lens	1	$ 178.18	$ 3.90	$ 174.28	0.03	10	15.6	$2.34	74.5
48	STUDY 2	2L4' 12W LEDT8/ELEE Low Pwr Lamp & Ballast	1	$ 76.91	$ 11.38	$ 65.53	0.04	25	45.5	$6.83	9.6
49	STUDY 3	2L4' 12W LEDT8/ELEE Low Pwr Lamp & Ballast	1	$ 76.91	$ 11.38	$ 65.53	0.04	25	45.5	$6.83	9.6
50	CHECK OUT DESK	35 WATT LED 1X4 Center Basket Fixture	2	$ 368.16	$ 34.45	$ 333.71	0.05	53	137.8	$20.67	16.1
51	CHECK OUT OFFICE	42 WATT LED 2X4 Center Basket Fixture	1	$ 199.42	$ 31.69	$ 167.73	0.05	53	126.8	$19.02	8.8
52	FRIENDS BOOKSTORE	42 WATT LED 2X4 Center Basket Fixture	4	$ 797.68	$ 126.78	$ 670.90	0.18	53	507.1	$76.07	8.8
53	RAMP HALL	35 WATT LED 1X4 Center Basket Fixture	7	$ 1,288.56	$ 120.58	$ 1,167.99	0.18	53	482.3	$72.35	16.1
54	BATH HALL - 6"	21 WATT LED 6" Recessed Can Retrofit Kit	2	$ 220.07	$ 17.91	$ 202.16	0.03	53	71.7	$10.75	18.8
55	MENS ROOM	44 WATT LED 2x4 Prismatic Fixture	1	$ 199.42	$ 14.30	$ 185.12	0.04	25	57.2	$8.58	21.6
56	WOMENS ROOM	44 WATT LED 2x4 Prismatic Fixture	1	$ 199.42	$ 14.30	$ 185.12	0.04	25	57.2	$8.58	21.6
57	CUSTODIAN	30 WATT LED 4' Strip Fixture w/Lens	2	$ 356.36	$ 7.80	$ 348.56	0.06	10	31.2	$4.68	74.5
58	MEETING ROOM	42 WATT LED 2X4 Center Basket Fixture	6	$ 1,196.52	$ 143.52	$ 1,053.00	0.28	40	574.1	$86.11	12.2
59	MEETING ROOM - 6"	21 WATT LED 6" Recessed Can Retrofit Kit	4	$ 440.14	$ 91.52	$ 348.62	0.18	40	366.1	$54.91	6.3
60	MEETING FRIENDS ROOM	42 WATT LED 2X4 Center Basket Fixture	3	$ 598.26	$ 53.82	$ 544.44	0.14	30	215.3	$32.29	16.9
61	MEETING FRIENDS ROOM	Install Wall Switch Occupancy Sensor with Plate	1	$ 69.62	$ 16.38	$ 53.24	0.13	10	65.5	$9.83	5.4
62	KITCHEN	44 WATT LED 2x4 Prismatic Fixture	2	$ 398.84	$ 28.60	$ 370.24	0.09	25	114.4	$17.16	21.6
63	CLOSET	30 WATT LED 4' Strip Fixture w/Lens	1	$ 178.18	$ 3.90	$ 174.28	0.03	10	15.6	$2.34	74.5
64	POST TOP -VD	30 WATT LED ROUND BARE Retrokit	5	$ 1,820.15	$ 327.60	$ 1,492.55	0.30	84	1,310.4	$196.56	7.6
65	POST TOP -VU	30 WATT LED ROUND BARE Retrokit	6	$ 2,184.18	$ 393.12	$ 1,791.06	0.36	84	1,572.5	$235.87	7.6
66	HIGH WALLPACKS	90 WATT LED Cut-Off Wall Pack Fixture w/Photo	2	$ 1,113.33	$ 447.72	$ 665.61	0.41	84	1,790.9	$268.63	2.5
67	BACK DOOR	27 WATT LED 8" Recessed Can Retrofit Kit	1	$ 106.20	$ 29.48	$ 76.72	0.03	84	117.9	$17.69	4.3
68	OLD ENTRANCE	19W LED Retrofit >12'	1	$ 48.09	$ 88.45	$ (40.37)	0.08	84	353.8	$53.07	-0.8
69	BULLET FLOODS	13 WATT LED Bullet Flood Fixture	4	$ 600.62	$ 270.82	$ 329.80	0.25	84	1,083.3	$162.49	2.0
70	SIGN FLOODS	13 WATT LED Bullet Flood Fixture	2	$ 300.31	$ 113.57	$ 186.74	0.10	84	454.3	$68.14	2.7
71	MAIN ENTRANCE	27 WATT LED 8" Recessed Can Retrofit Kit	4	$ 424.80	$ 74.41	$ 350.39	0.11	53	297.6	$44.65	7.8
72	MAIN ENTRANCE	10W LED A19 27-22K Retrofit	4	$ 72.69	$ 13.78	$ 58.91	0.02	53	55.1	$8.27	7.1
73		Power source abandoned for FI or CF	233	$ 1,787.11		$ 1,787.11					
74		Power source abandoned-HID-Interior/Exterior	41	$ 653.13		$ 653.13					
75		Material & Trash Handling	1	$ 833.08		$ 833.08					
76		Lift Rental	3	$ 1,858.50		$ 1,858.50					
77											
78											
79											
80											
81											
82											
83											
84											
		TOTALS:		**$90,694.51**	**$10,324.54**	**$80,369.97**	**15.21**		**41,298.14**	**$6,194.72**	**13.0**

Appendix B3

EVERSOURCE Municipal Program
Custom/Comprehensive Energy Efficiency Projects

Cost/Ben
0.25

Recommendations & Estimated Return On Investment (R.O.I.)

prepared by: AECOM Energy

EVERSOURCE APPLICATION NO: 0
AECOM ENERGY ID NO: MP160052
FACILITY NAME: Medfield Town Garage
ADDRESS: 55 N. Meadows Road
CITY/TOWN/ZIP: Medfield, MA 02052
CONTACT: Andrew Seaman
PHONE: 508-906-3013

** Ave. kWh rate: 0.150

DATE: 7/7/2015
AUDITOR: Derrek Brown
AUDITOR PHONE: 617-835-8261
ACCT NO: 0
FID NO/STATUS: 0

	INSTALLATION SITE	DEVICE DESCRIPTION	QTY	Total Cost	EVERSOURCE Incentive	Net Cost of Installation	Total KW Saved	Estimated Exist.Hrs.	Annual kwh Saved	Estimated $$ Saved **	Simple Payback
1	STORAGE BAYS	88 WATT LED 8' Strip Fixture w/Lens	90	$ 30,851.10	$ 1,017.90	$ 29,833.20	2.61	30	4,071.6	$610.74	48.8
2	STORAGE BAYS	88 WATT LED 8' Strip Fixture w/Lens	24	$8,226.96	$1,520.06	$6,706.90	0.70	168	6,080.3	$912.04	7.4
3	WASH BAY	60 WATT LED 8' VAPORTITE	20	$7,847.00	$101.40	$7,745.60	0.26	30	405.6	$60.84	127.3
4	MAINTENANCE BAYS	88 WATT LED 8' Strip Fixture w/Lens	30	$10,283.70	$339.30	$9,944.40	0.87	30	1,357.2	$203.58	48.8
5	STORAGE ROOM W/STAIRS (2)	60 WATT LED 8' Strip Fixture w/Lens	4	$1,257.88	$71.76	$1,186.12	0.18	30	287.0	$43.06	27.5
6	STORAGE ROOM W/STAIRS (2)	60 WATT LED 8' Strip Fixture w/Lens	4	$1,257.88	$271.44	$986.44	0.70	30	1,085.8	$162.86	6.1
7	STORAGE ROOM	80 WATT LED 8' Strip Fixture w/Lens	2	$657.26	$120.12	$537.14	0.31	30	480.5	$72.07	7.5
8	MECHANIC OFFICE	80 WATT LED 8' Strip Fixture w/Lens	4	$1,314.52	$57.72	$1,256.80	0.15	30	230.9	$34.63	36.3
9	HALLWAY	27 WATT LED 4' WRAPAROUND	1	$177.00	$13.52	$163.48	0.03	40	54.1	$8.11	20.2
10	HALLWAY	33 WATT LED 2x2 Prismatic Fixture	11	$1,869.12	$74.36	$1,794.76	0.14	40	297.4	$44.62	40.2
11	HALLWAY	33 WATT LED 2x4 Prismatic Fixture	6	$1,115.10	$62.40	$1,052.70	0.12	40	249.6	$37.44	28.1
12	MECHANICAL ROOM	30 WATT LED 4' Strip Fixture w/Lens	5	$890.90	$14.95	$875.95	0.12	10	59.8	$8.97	97.7
13	ELECTRIC ROOM	30 WATT LED 4' Strip Fixture w/Lens	2	$356.36	$5.98	$350.38	0.05	10	23.9	$3.59	97.7
14	MENS LOCKER	33 WATT LED 2x4 Prismatic Fixture w/Trim kit	6	$1,292.10	$31.20	$1,260.90	0.12	20	124.8	$18.72	67.4
15	MENS LOCKER	16 WATT LED 4' Wall Fixture	1	$188.80	$7.54	$181.26	0.03	20	30.2	$4.52	40.1
16	COAT CLOSET	33 WATT LED 2x4 Prismatic Fixture w/Trim kit	1	$215.35	$2.60	$212.75	0.02	10	10.4	$1.56	136.4
17	VESTIBULE AND HALL CANS	21 WATT LED 6" Recessed Can Retrofit Kit	6	$660.21	$40.56	$619.65	0.08	40	162.2	$24.34	25.5
18	CREW ROOM	44 WATT LED 2x4 Prismatic Fixture	8	$1,595.36	$118.56	$1,476.80	0.30	30	474.2	$71.14	20.8
19	FIRE DEPT LOCKER ROOM	33 WATT LED 2x4 Prismatic Fixture	3	$557.55	$15.60	$541.95	0.06	20	62.4	$9.36	57.9
20	FIRE DEPT LOCKER ROOM	16 WATT LED 4' Wall Fixture	1	$188.80	$3.12	$185.68	0.01	20	12.5	$1.87	99.2
21	FIRE DEPT GARAGE BAYS	88 WATT LED 8' Strip Fixture w/Lens	94	$32,222.26	$1,063.14	$31,159.12	2.73	30	4,252.6	$637.88	48.8
22	FIRE DEPT GARAGE BAYS	88 WATT LED 8' Strip Fixture w/Lens	24	$8,226.96	$1,520.06	$6,706.90	0.70	168	6,080.3	$912.04	7.4
23	CEMENTARY OFFICE	33 WATT LED 2x4 Prismatic Fixture w/Trim kit	2	$430.70	$20.80	$409.90	0.04	40	83.2	$12.48	32.8
24	COMM ROOM	44 WATT LED 2x4 Prismatic Fixture	2	$398.84	$39.52	$359.32	0.08	40	158.1	$23.71	15.2
25	HIGHWAY OFFICE	44 WATT LED 2x4 Prismatic Fixture	4	$797.68	$79.04	$718.64	0.15	40	316.2	$47.42	15.2
26	COMP ROOM	44 WATT LED 2x4 Prismatic Fixture	2	$398.84	$29.64	$369.20	0.08	30	118.6	$17.78	20.8
27	VESTIBULE ENTRANCE	33 WATT LED 2x4 Prismatic Fixture	1	$185.85	$10.40	$175.45	0.02	40	41.6	$6.24	28.1
28	WATER OFFICE	44 WATT LED 2x4 Prismatic Fixture	4	$797.68	$79.04	$718.64	0.15	40	316.2	$47.42	15.2
29	UNISEX BATH	27 WATT LED 4' WRAPAROUND	1	$177.00	$6.76	$170.24	0.03	20	27.0	$4.06	42.0
30	TRAINING ROOM	44 WATT LED 2x4 Prismatic Fixture	3	$598.26	$29.64	$568.62	0.11	20	118.6	$17.78	32.0
31	ENGINEERING ROOM	44 WATT LED 2x4 Prismatic Fixture	2	$398.84	$39.52	$359.32	0.08	40	158.1	$23.71	15.2
32		Material & Trash Handling	1	$1,028.96		$1,028.96					
33		Lift Rental	2	$1,062.00		$1,062.00					
34		Power source abandoned for FI or CF	80	$613.60		$613.60					
35		Power source abandoned-HIF-Interior/Exterior	282	$4,492.26		$4,492.26					
36											
37											
38											
39											
40											
41											
42											
43											

	INSTALLATION SITE	DEVICE DESCRIPTION	QTY	Total Cost	EVERSOURCE Incentive	Net Cost of Installation	Total KW Saved	Estimated Exist.Hrs.	Annual kwh Saved	Estimated $$ Saved **	Simple Payback
44											
45											
TOTALS:				**$122,632.68**	**$6,807.66**	**$115,825.02**	**11.00**		**27,230.63**	**$4,084.59**	**28.4**

VII. Appendix C: Town of Medfield Energy Measures – Town of Medfield

Appendix C1

Library T8 retrofit						
Number of bulbs	349			Cost per bulb	$ 1.00	Mass Save
watts per bulb	32			$/kWh	$ 0.12	
existing kW	11.168			$/KW	$ 20.00	
New watts per bulb	16					
New kW	5.58					
delta kW	5.58					
hours/yr	2920					
kWh saved/yr	16,305					
utility savings	$ 3,362.01					
Total cost	$349					
potential incentive	$ -					
Net cost after incentive	$349					
Payback (months)	1.2					
					2nd floor	81
					1st floor	126
					floor	142
					Total	349
						643

			Library Exterior Lights
: Upstream Incentive			

Appendix C2

EXISTING					
Town Hall T8 and 4-pin G11 retrofit					
Number of bulbs	389			Cost per bulb	$ 1.00
watts per bulb	32			$/kWh	$ 0.12
existing kW	12.448			$/KW	$ 20.00
New watts per bulb	16				
New kW	6.22				
delta kW	6.22				
hours/yr	2920				
kWh saved/yr	18,174				
utility savings	$ 3,747.35				
Total cost	$389				
potential incentive	$ -				
Net cost after incentiv	$389				
Payback (months)	1.2				

Mass Save Upstream Incentive

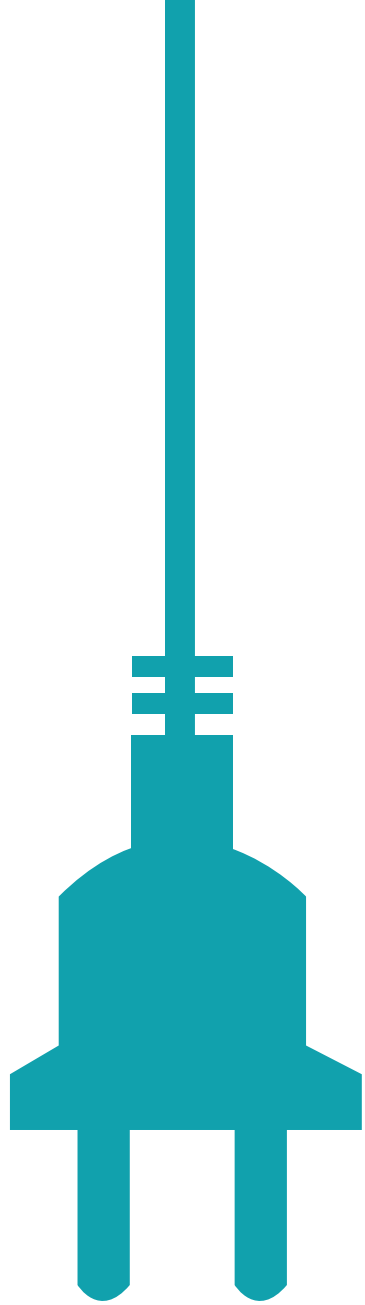
Appendix C3

Town Hall Parking Lot retrofit							
Number of bulbs	6			Cost per bulb	$ 185.00		
watts per bulb	455			Install cost	$ 1,200.00	200/light	
existing kW	2.73						
existing kWh	11302.2						
New watts per bulb	54			$/kWh	$ 0.12		
New kW	0.324			$/KW		demand	
New kWh	1341.36						
hours/yr	4140						
kWh saved/yr	**9960.84**						
utility savings	$ 1,235.14						
potential incentive	$ 2,490.21						
Total cost	$2,310						
Net cost after incentive	($180)						
Payback (months)	-1.8						
Town Hall Post Top Lights							
Number of bulbs	12			Cost per bulb	$ 30.00		
watts per bulb	175			Install cost	$ 3,000.00	100/bulb	
existing kW	2.1						
existing kWh	8694						
New watts per bulb	54			$/kWh	$ 0.12		
New kW	0.648			$/KW		demand	
New kWh	2682.72						
hours/yr	4140						
kWh saved/yr	**6011.28**						
utility savings	$ 745.40						15972.12
potential incentive	$ 1,502.82						
Total cost	$3,360						
Net cost after incentive	$1,857						
Payback (months)	29.9						
Library Post Top Lights							
Number of bulbs	11			Cost per bulb	$ 30.00		
watts per bulb	175			Install cost	$ 3,000.00	100/bulb	
existing kW	1.925						
existing kWh	7969.5						
New watts per bulb	54			$/kWh	$ 0.12		

New kW	0.594			$/KW		demand	
New kWh	2459.16						
hours/yr	4140						
kWh saved/yr	**5510.34**						
utility savings	$ 683.28						
potential incentive	$ 1,377.59						
Total cost	$3,330						
Net cost after incentive	$1,952						
Payback (months)	34.3						
COA Post Top Lights							
Number of bulbs	9			Cost per bulb	$ 30.00		
watts per bulb	175			Install cost	$ 3,000.00	100/bulb	
existing kW	1.575						
existing kWh	6520.5						
New watts per bulb	54			$/kWh	$ 0.12		
New kW	0.486			$/KW		demand	
New kWh	2012.04						
hours/yr	4140						
kWh saved/yr	**4508.46**						
utility savings	$ 559.05						
potential incentive	$ 1,127.12						
Total cost	$3,270						
Net cost after incentive	$2,143						
Payback (months)	46.0						

VIII. Appendix D: Town of Medfield Energy Measures – MAPC

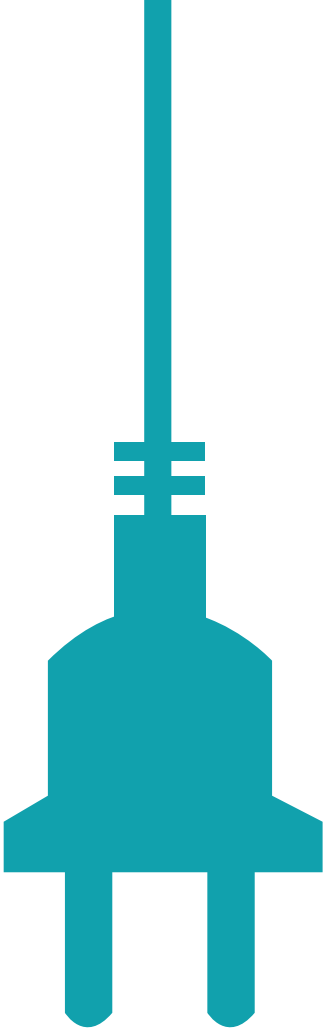
Appendix D1



POWERING DOWN:

A TOOLKIT FOR BEHAVIOR-BASED ENERGY CONSERVATION IN K-12 SCHOOLS

THE CENTER FOR GREEN SCHOOLS
U.S. GREEN BUILDING COUNCIL USGBC



POWERING DOWN:

A TOOLKIT FOR BEHAVIOR-BASED ENERGY CONSERVATION IN K-12 SCHOOLS

Kate Crosby

Lead Author
Antioch University New England, M.S., Resource Management and Conservation
Energy Manager, Acton-Boxborough Regional School District

Anisa Baldwin Metzger

Manager, School District Sustainability
The Center for Green Schools at the U.S. Green Building Council

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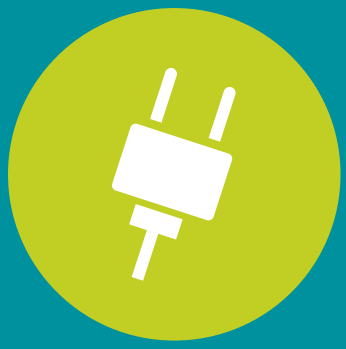
EXECUTIVE SUMMARY



Energy conservation presents a compelling and rich opportunity for K-12 schools. Historically, energy expenses in schools have been treated as relatively fixed and inevitable, flowing steadily in the background as administrators concentrated on urgent needs and programmatic priorities. There is growing awareness, however, that a focus on energy use in schools yields an array of important rewards in concert with educational excellence and a healthful learning environment. And there is new interest in behavior-based initiatives through which faculty, staff and students can be significant players in changing a school's energy profile.[1]

This report examines five public schools that have reduced their electricity use by an astonishing 20 to 37 percent through successful behavior-based strategies. These exemplar schools vary in their attributes and are spread across the United States, but their programs are linked and defined by shared elements and strategies. They have achieved these remarkable results while maintaining a strong commitment to a healthy and optimal learning environment in support of their central educational mission. Their successful experiences are reviewed in the following pages, and the strategies they have employed are synthesized into a "how-to" toolkit for schools everywhere.

The potential benefits of engaging faculty, staff and students in energy conservation initiatives are broad and substantial. The range includes significant cost savings, reduced environmental impact and expanded opportunities for student learning and leadership, in addition to positive effects extending beyond the immediate school community. These benefits are detailed in this report along with additional resources that clarify the case for energy conservation in K-12 schools.

INTRODUCTION

Energy costs loom large in school district budgets, comprising the second biggest operational expense after personnel.[2] Energy is a vital input in managing school buildings and optimizing the learning environment for students. Ensuring that lighting, indoor air quality and other needs are well provided for is essential. However, the U.S. Environmental Protection Agency (EPA) estimates that 25 percent of energy use in schools is wasted,[3] and significant opportunities exist to reduce energy costs (Figure 1, Appendix B). A focus for astute administrators, then, is tapping these opportunities to save energy, thereby freeing up funding for educational resources that would otherwise be lost on utility bills.

THREE COMPLEMENTARY AVENUES LEAD TO ENERGY SAVINGS IN SCHOOLS:

1. Raising awareness among faculty, staff and students
2. Managing school building operations
3. Upgrading mechanical equipment and controls

The first two avenues are behavior-based, work synergistically with each other and can be implemented without capital investment. The first avenue is focused on shifting behavior among all building occupants, while the second is concerned more specifically with shifting awareness among facilities and custodial staff who manage building operations. A third important avenue, if funding is available, is investment in upgrading the efficiency of equipment and controls.[4]

Behavior-based strategies offer a rewarding pathway for energy conservation in K-12 schools. These strategies are both accessible and relatively inexpensive for schools to implement, and yet they are capable of yielding significant results. A key focus is on **raising awareness among faculty, staff and students** about energy-saving opportunities (see Figure 2, Appendix B). A simple and powerful example of an intervention is ensuring that lights get turned off in unoccupied classrooms and offices, since lighting alone can account for 25% or more of all electricity consumed in a school.[5] Many additional strategies are detailed in the Toolkit included in this report.

The efficacy of a behavior-based approach can be further enhanced when custodial staff members are actively included in fostering a culture of energy conservation. If empowered to do so, custodial staff can offer critical insights about ways to lower a building's energy footprint through effectively **managing building operations**.[6]

Electricity is often a major focus of behavior-based strategies because the draw for lighting and plug load equipment can readily be reduced through choices made by faculty and staff end users. Turning off lights when unneeded, turning off equipment when not in use and reducing standby power are accessible measures that can produce significant savings. As an initiative gains momentum and awareness builds, members of the school community can identify additional opportunities for reductions in both natural gas and electricity. Cost savings are further enhanced as the school minimizes wear and tear on equipment through reduced run time and as it decreases the building's cooling load as equipment and lights are powered down.[7]

Upgrading mechanical equipment and controls offers another important avenue for improving energy efficiency in a school building. Typically, however, these mechanical upgrades require substantial capital investment that poses a far steeper challenge for school districts than initiating a behavior-based program. Potentially, savings generated through a behavior-based program can subsequently be invested in funding mechanical efficiency upgrades, providing one option for financing these projects.

SCHOOL ENERGY USAGE

Energy use in schools falls into three main categories:

HVAC (heating, ventilation, air conditioning) is usually the largest component of energy consumption, with natural gas typically used for heating and electricity for cooling.[8]

LIGHTING accounts for 25 to 50 percent of total electricity use. Lighting tends to be overlooked, as it runs in the background, and yet it consumes significant energy. Strategies to reduce electricity used by lighting while maintaining safety and comfort are discussed in this report.[9]

PLUG LOAD is the electricity drawn by equipment powered through wall outlets and has been measured at approximately 25 percent of a school's total electricity use. Plug load encompasses a wide range of equipment, including computers and monitors, copiers and printers, projectors, audiovisual equipment, vending machines, microwaves, coffeepots and refrigerators.[10]

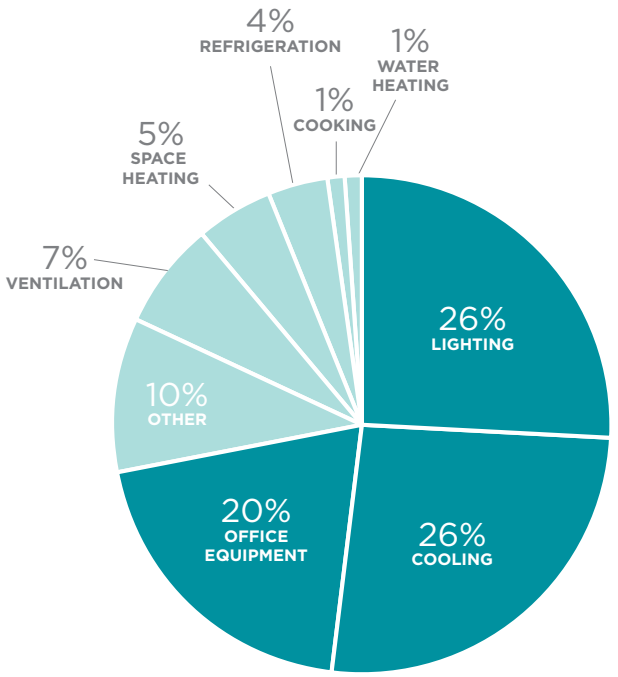


FIGURE 3 One example of electricity use within a school, though the profile will differ depending on a school's location and climate.

Credit: "E Source; from Commercial Building Energy Consumption Survey, 1999 data" in U.S. EPA, ENERGY STAR Building Upgrade Manual, 2008

BENEFITS OF ENERGY CONSERVATION STRATEGIES

The benefits that accrue through building an energy conservation initiative within a K-12 school can be broad and compelling. The review that follows includes significant findings by researchers from the non-profit, governmental and academic sectors.

COST SAVINGS

Energy costs are the second largest expenditure within school district budgets, exceeded only by personnel.[11] As a result, significant savings can be carved out for reallocation to needed services if energy consumption can be reduced. Notably, also, energy costs can be cut without reducing the quality of educational programming, in contrast to other budget categories. Implementing a behavior change initiative has been demonstrated to be a remarkably cost-effective pathway

toward capturing energy savings, since capital investment and mechanical retrofits are not required. Collectively, US schools spend $8 billion each year on energy, a sum larger than that spent on textbooks and computers combined, and the U.S. EPA estimates that $2 billion of that total can be saved through conservation and efficiency.[12]

REDUCED ENVIRONMENTAL IMPACT

Reducing wasted energy offers an excellent chance to shrink a school's environmental footprint. By turning off unneeded lights and cutting other wasted energy, students, staff and faculty can have an immediate impact. Reducing *electricity* consumption is especially meaningful, as the footprint of coal and gas-fired power plants is exaggerated by inherent system inefficiencies; approximately half of the fossil fuel consumed in power plants goes to losses within the plants themselves.[13]

A drop in electricity demand delivers these benefits:

- **REDUCED GREENHOUSE GAS PRODUCTION**: Fossil fuel combustion produces carbon dioxide and other greenhouse gases.[14]
- **REDUCED AIR POLLUTION:** Fossil fuel combustion produces sulfur and nitrogen oxides which form smog and acid rain, contributing to asthma, other respiratory illnesses and environmental degradation.[15]
- **REDUCED MERCURY IN THE ENVIRONMENT:** Coal-fired power plants release mercury that enters the food chain.[16]
- **REDUCED DISRUPTION OF AQUATIC ENVIRONMENTS:** In cases where large quantities of water are used for cooling, the contents of water discharge can disturb neighboring aquatic environments.[17]
- **REDUCED DISTURBANCE:** The extraction and transportation of fossil fuels are a source of significant environmental damage.[18]

LEARNING & LEADERSHIP OPPORTUNITIES FOR STUDENTS

Student participation in an energy conservation initiative can yield many positive outcomes for students. The experience offers rich opportunities for student learning through engagement with the design and operation of the school building. David Orr speaks to this when he writes, "Buildings have their own hidden curriculum that teaches as effectively as any course taught in them."[19] In a recent study published in the *Journal of Environmental Education*, researchers describe a "synergistic relationship" between enhanced student learning and an energy conservation focus.[20] In addition, students gain leadership skills and a valuable sense of efficacy as they make significant contributions in shifting school culture toward a higher level of sustainability.[21]

BENEFITS BEYOND THE SCHOOL SETTING

Research interviews conducted for this study made clear that energy conservation insights learned in school can be applied at home by students and their families, thus multiplying the benefits through residential energy conservation. More research about this effect is needed, but a number of studies document the ability of students to influence choices made at home by their families related to environmental issues.[22] In evaluating a school-based energy conservation program, one group of researchers interviewed parents and confirmed that students had discussed information learned at school with their families, and in some cases had asked their families to "change their attitudes or household practices."[23]

MODELS OF SUCCESS
CASE STUDY SCHOOLS

The research that supports this report explores and documents five schools that have each created a behavior-based energy conservation program. Participating schools include elementary, middle and high schools and vary in size, geographic location and age of school building. Though they are "exemplar" schools in their energy conservation achievements, they otherwise resemble their peer institutions across the country (see Appendix A).

These schools have achieved dramatic reductions in electricity use—ranging from 20 to 37 percent—entirely through behavior-based strategies. The savings are the fruits of collaborative efforts among faculty, staff and students working to promote the adoption of energy-conserving behaviors, and they were achieved *without capital investment or mechanical upgrades*. Verification that these savings are indeed due to behavior-based strategies is an important element of this study. Schools were carefully screened for participation based on the clarity of their energy data; in each case, the data depict a clear story without confounding effects from renovations, new construction or upgrades to mechanical equipment. In addition, the length of the data sets (ranging from four to six years) speaks to persistent progress within these schools, indicating that the reductions achieved are not aberrations.

The percentage of annual cost savings is significantly lower than the actual electricity reduction in four out of the five cases documented. In these schools' regions, rate increases by utilities have eliminated part of the cost savings that might have otherwise been expected. The substantial cuts in energy usage have allowed these districts to hold the line on energy costs that would otherwise have increased dramatically.

POWERING DOWN
DROP IN ELECTRICITY USE DUE TO BEHAVIOR-BASED ENERGY CONSERVATION STRATEGIES

SCHOOL	Annual Reduction in Electricity Usage vs. Baseline Year		Annual Cost Savings vs. Baseline Year		Length of Time Covered by Energy Data	Baseline Year
	%	kilowatt-hour (kWh)	%	$		
Holston MS *Knoxville, TN*	-37%	-848,929	-12%	-$19,816	6 years	Fiscal Year 2007
Rosa Parks ES *Lexington, KY*	-36%	-645,900	-20%	-$24,500	4 years	Fiscal Year 2009
Laguna Creek HS *Elk Grove, CA*	-30%	-663,232	-19%	-$47,704	4 years	Fiscal Year 2009
Henderson HS *West Chester, PA*	-30%	-1,359,672	-28%	-$121,821	5 years	Calendar Year 2008
John Jacobs ES *Phoenix, AZ*	-20%	-250,797	-10%	-$12,463	5 years	Mar., 2007 - Feb., 2008

SHARED CHARACTERISTICS OF EFFECTIVE PROGRAMS

The successful programs at these exemplar schools are built through a variety of pathways – no single recipe exists. In one case, the school's program is constructed through an active dialog between district staff and school-based staff. In another, an experienced practitioner is contracted by the district to build and support the program. In a third, students and a faculty advisor provide the driving force in shaping and implementing the successful program.

> "To really get a successful conservation program in place, you have to engage with the children directly because they drive it every day—they practice it continuously."
>
> - Energy Manager, Knox County Schools

Despite the varied approaches taken by the exemplar schools, shared characteristics show up across all five programs. Many of the faculty and staff interviewed reported that early successes were reached more easily than anticipated. The work, though substantial, typically consists of elevating awareness and overcoming inertia rather than opposition.

1 SCHOOL DYNAMICS AND LEADERSHIP

STAFF LEADERSHIP: One or more committed faculty and/or staff members provide leadership in implementing the initiative in each of the schools. These leaders are empowered to shape strategies and materials to make the program most effective within their own school community.

PRINCIPAL SUPPORT: The school principal provides essential support, highlighting the initiative and signaling commitment and endorsement to the school community. Communication is coordinated with the initiative leader(s) as needed.

STUDENT ENGAGEMENT: Faculty and/or staff leaders actively develop student participation in the initiative. Student engagement serves as a central driver in four of the exemplar programs and contributes significant value in all, generating momentum, creativity and a positive focus in fostering new norms.

INCLUSIVE TEAM: School-based custodial staff members are included as participants in the initiative (and provide primary leadership at one of the case study schools).

2 DISTRICT-LEVEL SUPPORT

DATA AND FEEDBACK: An Energy Manager or other point person at the district level provides the critical function of tracking energy data for the school and then communicating this information as feedback about progress (see Figure 4, Appendix B). This essential support is made available in all cases studied.

PROGRAM ASSISTANCE: In most of the programs studied, the school district (or third party partner) offers additional support beyond tracking energy data. The district support varies in depth and scope among the five programs, but can include the following: assistance with identifying priorities, signage, educational resources, recognition for successes and equipment loans such as watt meters or light meters.

ADDITIONAL PARTNERS: In two of the exemplar schools, the program is supported successfully with school district resources. A third party organization provides support in three of the exemplar schools. Where a third party organization is involved, the support is non-proprietary and emphasizes school-based empowerment and capacity-building. These organizations provide educational resources, energy data tracking and/or additional services. Cost savings generated through the energy conservation program are retained within the district.

3 PROGRAM MOMENTUM

PROGRESS REPORTS: Energy data illustrating a drop in the school's energy consumption as the program becomes established are repeatedly cited by faculty and staff as compelling and strongly motivating.

CLEAR COMMUNICATION: Cost savings associated with energy conservation are highly valued by faculty and staff and are understood as directly beneficial for educational programming.

AWARDS AND HONORS: Recognition of energy conservation successes provided within the school, at the district level and by other organizations is highly valued by faculty and staff (see Figure 5, Appendix B).

TOOLKIT: CREATING AN EFFECTIVE ENERGY CONSERVATION INITIATIVE

To create your own energy conservation initiative, start by following the steps in this toolkit. A range of successful strategies employed in the exemplar case study schools is presented here, as well as a few examples from other programs. Each case study school used their own mix of the steps in this toolkit, so it makes sense to pick and choose what is best suited for your community.

STEP 1. FIGURE OUT WHO'S ON THE TEAM

Identify key people who will provide support for the initiative within the school community. The exemplar programs in the study all include:

1. Leadership from one to three committed faculty or staff member(s)
2. Explicit, strong support from the principal
3. Support from the school district in tracking energy data, along with other programmatic or technical assistance that may be available

Identify ways in which students can be engaged with the initiative, and aim to include custodial staff early on. Custodial staff members can be key players, providing support and contributing ideas about how to modify building operations to conserve energy, such as reducing hallway lighting after the school day ends. Office staff and food services staff may have valuable suggestions and insights to contribute as well. Aim to build a team that is committed to staying involved over time to provide continuity.

STEP 2. GATHER INFORMATION AND IDENTIFY PRIORITIES

The exemplar schools have utilized one or a combination of the following basic strategies to shape their programs:

ENERGY CHECKUPS AND ENERGY PATROL

Create a student team to do checkups of classrooms and offices on a regular basis, leaving feedback for faculty and staff about whether lights are off in unoccupied spaces and equipment is powered down when not needed (see Figure 6, Appendix B). It is helpful to conduct an initial assessment without any publicity to create a baseline for measuring future progress. Checkups can be scheduled before or after school or during the school day as fits best, and they can happen on any frequency that is most helpful. One exemplar school found that student-led energy patrols were effective even when spaced as widely as a month apart. Students can track progress over time using a clipboard, computer, iPad or other device. The key element is providing clear, respectful feedback notes with plenty of praise when classrooms and offices are powered down.

Standby power, also called vampire power or phantom load, refers to equipment that draws electricity even when turned off. Examples include items with remote controls or digital displays, chargers, televisions, DVD players, powered speakers and coffee pots that keep water heated for brewing. Standby power can account for five percent or more of total electricity consumption in a school. It can be addressed by investigating the standby power of equipment before you buy it, by unplugging devices when not in use or by plugging into power strips so that the power can be entirely turned off when not needed. The best way to identify "vampires" around the school is by measuring devices with a simple tool such as a watt meter—a great opportunity to involve students.[24]

ENERGY MAP

Work with a student team to map out energy use in the school using simple tools (e.g., watt meter, light meter) and then generate suggestions for conservation (see Figure 7, Appendix B). The team can identify high priority "energy hogs," such as computer monitors and vending machines, calculate how much money can be saved by turning off equipment when not in use, identify "phantom load" equipment and/or identify spaces that are more brightly lit than needed. A mapping survey provides a tremendous learning opportunity for students and adults alike and transforms the team into hands-on energy experts.

BUILD ON PRIORITIES FROM FACILITIES STAFF

Take the time to find out what the district-level energy priorities are, highlight them and build on the system-wide momentum. In some cases, facilities staff may have already developed an energy conservation strategy with a behavior change emphasis, and a school-based team can focus their creative efforts on spreading the word. Rather than spending time to create something from the ground up, exemplar schools that used this strategy were able to put their energy into quick mobilization.

STEP 3. CREATE MOMENTUM

There are many methods to distribute information and generate momentum within a school community. Examples from the exemplar schools include:

CONSISTENT FEEDBACK

Write thank you and "oops" notes for individual classrooms and offices during energy checkups. Clear, specific, appreciative feedback for faculty and staff is tremendously effective. Pre-printed notes can work if time is short.

VISUAL RESULTS

Compile results of checkups and audits, and share them in a chart or spreadsheet with those interested.

PROMPTS AND REMINDERS

Create "prompts" in the form of small, visual reminders that are placed for maximum impact to motivate new behavior. Good examples include stickers on switch plates to encourage lights out or reminders on printers to encourage turning them off at day's end. Making prompts can be another great opportunity to involve students' creativity.

CLEAR ACTION STEPS

Make checklists to share with classrooms and offices as guidelines for energy-conserving actions (see Figure 8, Appendix B).

TIME-SENSITIVE GOALS

Focus on "Power Down Fridays" and vacation shut-downs to highlight the extra savings available when schools are unoccupied.

STUDENT INVOLVEMENT

Help students create presentations about energy team findings for the school community, faculty or the school board or committee.

SCHOOL-SPECIFIC SOLUTIONS

Use your own creativity, and pull in the strategies that you know will work in your own school posters, flyers, skits, faculty meetings, emails, morning announcements, bulletin boards, T-shirts, websites and more.

STEP 4. CELEBRATE SUCCESS AND PROVIDE RECOGNITION

Recognition is an essential element in all the exemplar programs, and it is also an opportunity for creativity and fun.

SCHOOL: An enthusiastic thank you note, an "energy star" on a classroom or office door or a handmade certificate of recognition can provide direct feedback to faculty and staff for excellence in powering down. Highlighting success stories with a hallway display is another avenue for feedback and encouragement.

DISTRICT: Energy use starts to shift downward in participating schools as the program gains traction. This downward trend in energy data is cited over and over again in study interviews with faculty and staff as highly motivating and rewarding – a striking finding. Make sure the good news gets out through posters, email, a website link and any other available communication channels. Several of the exemplar programs arrange for district-wide recognition at regular monthly events or at special events incorporated into a school district board meeting. In some cases, districts choose to employ competition in moderation by recognizing top-performing schools; in other cases, all schools that achieve a given mark, such as the EPA's ENERGY STAR award, are recognized.

Two key concepts that come from the field of social psychology can help encourage the adoption of new energy-conserving behaviors:

- Framing the initiative as an emerging "social norm" within the school is a powerful tool for increasing participation, since most people are strongly motivated to be part of a community and align with what others are doing. Highlight examples of people adopting new behaviors as a way of inviting others to join in.[25]
- Emphasize personal contact in getting the message out. Information is not enough to create a shift in behavior. Analyze the specific barriers that make a change difficult and look for solutions that simplify shifting to a new behavior. Find ways to make it easy and appealing.[26]

NATIONAL, REGIONAL, STATE: Seek out opportunities for recognition on a wider scale. The EPA awards ENERGY STAR plaques to schools achieving a score of 75 or above in energy efficiency nationally (a percentile rank within the ENERGY STAR Portfolio Manager program), and this achievement has been an important milestone to celebrate for some of the exemplar schools. Other recognition programs highlight student engagement and curriculum connections as well as energy savings, including the Eco-Schools USA "Green Flag" program through the National Wildlife Federation, the National Energy Education Development Project (NEED) Youth Awards, the "Greenest School on Earth" and "Best Of Green Schools" awards at the Center for Green Schools at USGBC, and the Green Ribbon Schools award program created by the U.S. Department of Education. As interest grows, explore additional activities.

STEP 5. INITIATE SPECIAL PROJECTS

Check with the local utility company to see if funding or other support is available. Here are a few ideas to get you started:

LIGHT BULB EXCHANGE

Set up a light bulb exchange to give out free compact fluorescent light bulbs in exchange for energy-wasting incandescent light bulbs, and encourage staff and faculty to make the swap. Check with your facilities department to see if they can provide free CFLs. Learn more at sustainability.tufts.edu/get-involved/bulb-exchange/.

EQUIPMENT GIVE-AWAY

Offer to deliver free power strips to staff and faculty who express interest so that it's easier to power down equipment.

VENDING MACHINE AUDIT

Investigate options for cutting down power going to vending machines, such as installing Vending Misers. Measure and document the energy savings to inspire additional projects. Learn more at acespace.org/node/15305

COMPUTER POWER-DOWN

Work with the IT department to (1) make sure that computer screens power down after 10-15 minutes (screen savers do not save energy) and (2) maximize power down time for computers, especially on evenings and weekends.

DELAMPING

Use a light meter to look for areas that are more brightly lit than needed. With your facilities department, explore whether de-lamping is an option. Learn more at bu.edu/sustainability/what-were-doing/energy/delamping/

SCHOOL-WIDE EDUCATION

Put on an energy fair for the school or community. Learn more at need.org/needpdf/Energy%20Carnival.pdf.

GHG INVENTORY

Create a substantive greenhouse gas (GHG) inventory for the school using the EPA's Climate CHECK software, recommended for high school students. Learn more at epa.gov/climatechange/wycd/school.html.

PROFILES OF PARTICIPATING SCHOOLS

ROSA PARKS ELEMENTARY SCHOOL

Fayette County Public Schools, Lexington, KY
rosaparks.fcps.net | sustainability.fcps.net/sustainability

An active student recycling club was the launching point for a new "Energy Stars" club at Rosa Parks. The Energy Stars conduct once-a-month checkups in classrooms to assess if lights are out and computers are turned off via power strip, leaving thank you notes or reminder notes for teachers. They also meet monthly with their two faculty advisors to tackle other projects, including developing energy conservation checklists for each classroom, launching a "No Idling" campaign and helping to organize a Sustainability Fair. The team's efforts are part of a school-wide energy efficiency commitment, which is supported through the robust "E=USE2" sustainability program developed by the district (including web-based resources). Cost savings support the general school district budget; the program does not include a direct financial incentive to the school. Rosa Parks received an ENERGY STAR award from the EPA and was one of the inaugural "Green Ribbon Schools" recognized by the U.S. Department of Education in 2012.

HOLSTON MIDDLE SCHOOL

Knox County Schools, Knoxville, TN
holstonms.knoxschools.org | knoxschools.org

The Green Team at Holston Middle School collaborates with the nonprofit Alliance to Save Energy and their PowerSave Schools program. The Alliance provides a toolkit to the team (including a Kill A Watt® meter, light meter, an infrared thermometer and other tools) and guidance on how to use the tools to analyze energy use and develop recommendations. The student team and their faculty advisors have created energy checklists for classrooms as well as a school-wide education program, and they have also used the data available to them to understand and respond to energy demand at their school. The head custodian is part of Holston's Green Team and coaches students about energy conservation in addition to implementing efficiency measures in school operations. Faculty advisors from nine schools in the district are working with the Alliance. They meet three times a year to share ideas and practices related to energy conservation, and students attend the final meeting of the year to share information as well. Holston receives a small financial incentive for participating in the program, which is not tied directly to energy savings. Alliance to Save Energy – PowerSave Schools: ase.org/programs/powersave-schools

JOHN JACOBS ELEMENTARY SCHOOL

Washington Elementary School District, Phoenix, AZ
johnjacobs.wesdschools.org | wesdschools.org/Page/1

Momentum on energy conservation at John Jacobs has been spurred by the school-based facility manager, whose interest and enthusiasm have grown into a school-wide team effort. As part of the initiative, student council members check on classrooms once a week at the end of the school day to see if they can "catch" any lights or computers left on so that they can leave a "watt ticket" as a reminder to power down. Students in each class make sure lights are turned out when it is time for the class to go to lunch or gym. Other measures include ensuring that outside doors stay shut during the long cooling season and reducing the use of personal equipment, such as mini-fridges. Cost savings support the general school district budget; the program does not include a direct financial incentive to the school. Pierce Energy Planning provides support to the district in energy data tracking and program development. John Jacobs received an ENERGY STAR award from the EPA. Pierce Energy Planning: energyplanning.org

LAGUNA CREEK HIGH SCHOOL

Elk Grove Unified School District, Elk Grove, CA
lchs.schoolloop.com | egusd.net/energy

The energy conservation initiative at Laguna Creek has been led by a faculty member and the head custodian. A major focus has been on asking faculty to treat their classrooms as they would their homes, turning off lights when leaving the room and turning off equipment at the end of each day. Students have helped with a campaign to place green tape over one of the multiple light switches in each classroom as a reminder to reduce unneeded lighting. They have also given away raffle tickets for prizes when they have found classrooms powered down during checkups. The head custodian and her staff have been very active in reducing unneeded lighting and ensuring that equipment is turned off when not in use. Laguna Creek receives a modest financial incentive from the district for attaining energy conservation goals set for each school by district staff. The district has developed a rich framework of web-based resources to support the efforts at Laguna Creek and other district schools.

HENDERSON HIGH SCHOOL

West Chester Area School District, West Chester, PA
edline.net/pages/henderson_high_school | home.wcasd.net/pages/West_Chester_Area_SD

A longstanding Environmental Club at Henderson turned its focus to energy conservation when the principal met with the group to ask them to consider becoming leaders on the issue. Student brainstorming led to the development of "Power Down Friday," in which hallway lights are minimized and attention is focused on powering down the building ahead of the weekend. One of their advisors, an art teacher, has supported the students in producing original "Power Down" artwork and silk-screened T-shirts and distributing bookmarks crafted from handmade paper during classroom checkups. A $150,000 Climate Showcase Community grant to the district from the EPA was used to develop a Student Conservation Corps through which students learned more about energy conservation by providing energy audits for area businesses. Cost savings from efforts at Henderson support the general school district budget; the program does not include a direct financial incentive to the school. Practical Energy Solutions supports the district by tracking energy data and collaborating on presentations about energy conservation opportunities. Practical Energy Solutions: practicalenergy.net

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[24] Ballantyne, Fien and Packer, Program effectiveness in facilitating intergenerational influence in environmental education.

[25] Stewart, Vampire power is scary all year round.

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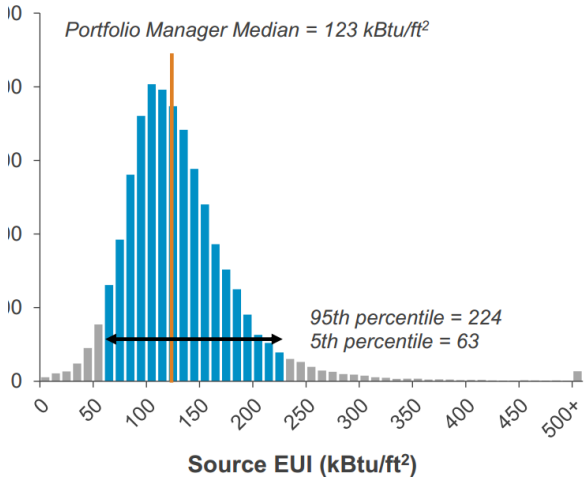
APPENDIX A:
CASE STUDY SCHOOL CHARACTERISTICS

▼ **POWERING DOWN (p. 5):**
Case Study School Characteristics

School	Grades Served	School Enrollment	Date of Construction or Renovation of School Building	District	District Enrollment
Holston MS *Knoxville, TN*	6 - 8	833	1956 construction 2006 renovation & addition	Knox County Schools	56,000
Rosa Parks ES *Lexington, KY*	K-5	765	1997	Fayette County Public Schools	38,000
Laguna Creek HS *Elk Grove, CA*	9 - 12	1,640	1994	Elk Grove Unified School District	62,000
Henderson HS *West Chester, PA*	9 - 12	1,260	1954 construction 2006 addition	West Chester Area School District	11,800
John Jacobs ES *Phoenix, AZ*	PK-6	613	1980	Washington Elementary School District	22,335

APPENDIX B:
IMAGES

▼ **FIGURE 1 (p. 2):** This chart, from the U.S. EPA's 2012 document Energy Use in K-12 Schools, displays energy use intensity (EUI) in K-12 schools. The figure is based on data reported by schools through EPA's free Portfolio Manager online tool. The least efficient school buildings use four times more energy per square foot than the most efficient ones. Notably, older schools can sometimes be very energy efficient - the way in which a school building is managed has a big influence on how it stacks up. (Flippen 2010)

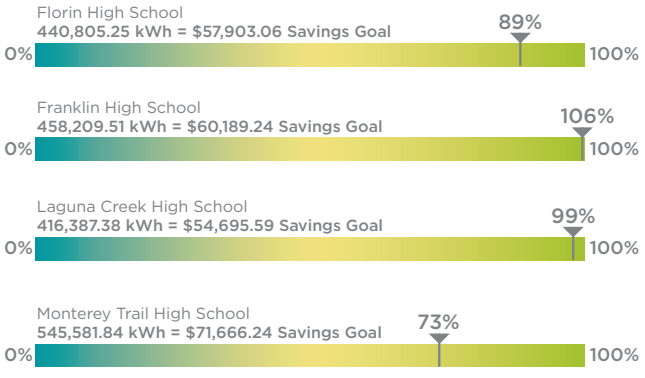


▼ **FIGURE 2 (p. 2):** Student artwork used to raise awareness about a school "lights out" campaign.

Credit: Graphic Design class at Henderson High School, West Chester Area School District

▼ **FIGURE 4 (p. 7):** Energy data and progress toward energy conservation goals are displayed in this web-based format developed by Elk Grove Unified School District.

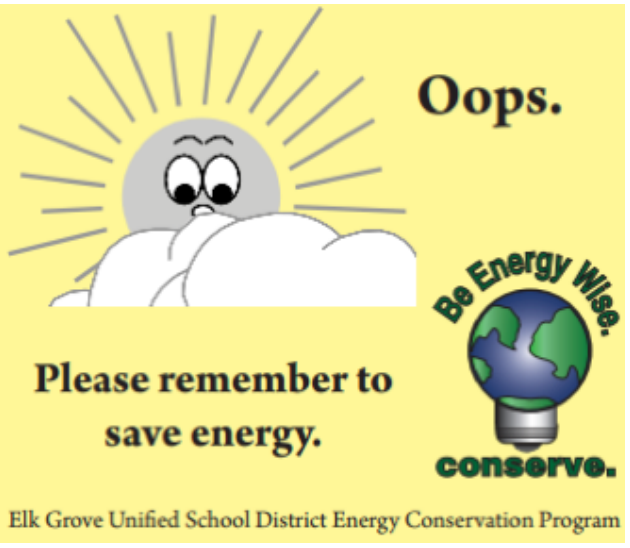
Credit: Elk Grove Unified School District



APPENDIX B: IMAGES

▲ **FIGURE 5 (p. 7):** Fayette County Public Schools in Kentucky holds a monthly recognition ceremony for the schools with the largest drop in energy use.

Credit: Fayette County Public Schools



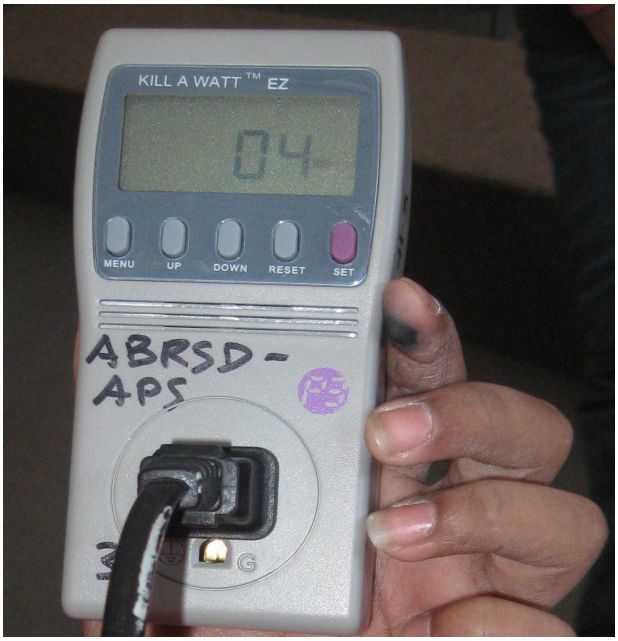
▲ **FIGURE 6 (p. 9):** Energy checkup notes for classrooms and offices

Credit: Elk Grove Unified School District

APPENDIX B: IMAGES

▼ **FIGURE 7 (p. 9):** Students can measure the power draw of various devices with hand-held meters to help establish energy conservation priorities.

Credit: Kate Crosby



▼ **FIGURE 8 (p. 10):** Classroom checklist developed by the "Energy Stars" team at Rosa Parks Elementary School in Kentucky. "Watty" is an energy superhero created by a Rosa Parks parent.

Credit: Fayette County Public Schools

E=USE^2 Classroom Checklist

Lights out

- Before school
- After school
- Recess
- Lunch

Computer monitors & printers off

- when not in use

Personal appliances off

- when not in use

Doors closed

- During class
- When room is unoccupied

Windows closed

When heat or cooling on

WATTY says . . .

- **Lights off** when sun provides enough light
- **Blinds closed** to reduce heat from sun on warmer days
- **Blinds open** to admit heat from sun on cooler days
- **Thermostat** No electronic equipment within five feet

APPENDIX C:
ADDITIONAL RESOURCES

USGBC RESOURCES

- The Center for Green Schools at the U.S. Green Building Council: centerforgreenschools.org
- Green Existing Schools Toolkit: centerforgreenschools.org/k12toolkit
- Energy Efficiency Strategies for Schools: Top Ten No-Cost Ways to Lower Your School's Utility Bills (Powerpoint): centerforgreenschools.org/toolsandpresentations
- Top 11 Ways to Green Your School (Powerpoint): centerforgreenschools.org/toolsandpresentations
- Green Existing Schools: Energy Management (Web Training): centerforgreenschools.org/utility-nav/resources/webtrainings/greenexistingschools.aspx

PUBLICATIONS

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- Watt Watchers of Texas, University of Texas at El Paso. (n.d.). Watt Watchers of Texas program manual. Retrieved from wattwatchers.org/Assets/manual.pdf

WEB-BASED RESOURCES

- School Energy and Recycling Team (SERT), Montgomery County Public Schools (how-to resources for behavior-based program): montgomeryschoolsmd.org/departments/facilities/greenschoolsfocus/sert.shtm
- Oklahoma Green Schools (toolkit list for energy investigations): okgreenschools.org/ogsp/wp-content/uploads/2011/04/toolkitinventory.pdf
- Oklahoma Green Schools (instructional video on how to use tools for energy investigations): youtube.com/watch?v=kbVYc5N_E4g&feature=youtu.be
- National Energy Education Development Project (curriculum resources): need.org
- U.S. Department of Energy: energy.gov
- Energy Information Administration: eia.gov
- Kids Saving Energy, U.S. Department of Energy: eere.energy.gov/kids/
- Energy Kids, U.S. Department of Energy: eia.gov/kids/
- Lawrence Berkeley National Lab (explanation of standby power): standby.lbl.gov/standby.html
- Energy Quest, California Energy Commission: energyquest.ca.gov/index.html
- California Energy Commission ("Energy Patrol" guide): energy.ca.gov/2007publications/CEC-180-2007-001/CEC-180-2007-001.PDF

APPENDIX D:
STUDY METHODOLOGY

Case study methodology was used to examine five schools with exemplar behavior-based energy conservation initiatives. Threshold elements for case selection included an established energy conservation initiative focusing on behavior change strategies, an ongoing practice of tracking energy data and the ability to provide clear documentation of energy data demonstrating a drop in energy consumption without confounding effects from mechanical projects, renovations or new construction. The U.S. Green Building Council served as a key informant, providing access to schools and guiding case selection. Three or more interviews were conducted at each site with staff, faculty and administrators. Energy data was collected along with other supporting material (such as flyers, photos and artwork).

Qualitative analysis of the interviews was performed, and findings for each case were corroborated across multiple interviews and through supporting material. Characteristics common to multiple cases were identified and described. Energy data was evaluated through quantitative and qualitative analysis and was reliably tied to behavioral change through the report of the energy manager associated with each school district as well as through interviews. A literature review of benefits associated with behavior-based energy conservation strategies was developed, and strategies used in the exemplar schools were synthesized into a "toolkit." An interim report was presented at the National Green Schools conference in February, 2012.

ACKNOWLEDGEMENTS

Special thanks to the dedicated trailblazers figuring out how energy conservation works in K-12 schools, including the many professionals who gave generously of their time and talent to offer their insights for this study. Thanks also to Dr. James Gruber of Antioch University New England for his guidance in the planning and execution of this research, and to Lindsay Baker for inspiration and support.

ABOUT THE AUTHORS

Kate Crosby, who compiled the content and acted as lead author on this report, serves as the Energy Manager for the Acton-Boxborough Regional School District. Her studies in the Resource Management and Conservation program at Antioch University New England included the research that forms the basis of this report.

Anisa Baldwin Metzger oversaw the final content, editing and production of this report for the Center for Green Schools. In her role as School District Sustainability Manager at the Center, she connects school staff with the resources and research they need to maintain healthy, efficient and sustainable schools.

THE CENTER
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Appendix D2

Vehicle Energy Savings Table

Municipal Fleet Energy Reduction Strategy[1]	**Details**	**Estimated Reduction in Consumption (% of Vehicle Consumption)**
Closely monitor tire air pressure. When ready for replacement, choose fuel efficient tires.	Maintaining appropriate air pressure in vehicle tires can decrease that vehicles fuel consumption by as much as 4%.[2]	2% - 4%
Use 100% synthetic oil in all vehicles.	The use of 100% synthetic oils reduces fuel consumption, the number of annual oil change and labor costs.[3]	2%
Institute the use of a Digital Fleet Management System	Using a digital fleet management system can result in reduced vehicle miles traveled and reduced fuel requirements, consequently bringing about a reduction in energy use.[4]	4%
Total Reduction in Vehicle Energy Consumption (%)	**Based on Predicted Fuel Consumption)**	8 – 10%

1 The data presented in this table is informed by energy reductions in Green Communities: Framingham, Northfield, Westford and Gill as well as the government "Fuel Economy" website.
2 http://www.fueleconomy.gov/feg/pdfs/OwnerRelatedFuelEconomyImprovements.pdf
3 http://www.fueleconomy.gov/feg/pdfs/OwnerRelatedFuelEconomyImprovements.pdf
4 http://www.fueleconomy.gov/feg/pdfs/OwnerRelatedFuelEconomyImprovements.pdf

IX. Appendix E: Town of Medfield Streetlight Measures – Fred Davis Corporation

Appendix E1

LED STREETLIGHT REPLACEMENT
TOWN OF MEDFIELD

PROJECT ESTIMATE SUMMARY

	Existing	Proposed	Saved	% Saved	
Watts	24,955	9,538	15,417	62%	
Annual KWH	104,811	39,808	65,003	62%	
Annual Utility Expenses	$42,132	$6,692	$35,441	84%	1
Annual Maintenance Expenses				---%	2
Total Expenses	$42,132	$6,692	$35,441	84%	

Quantity	347	
Price of old HID Fixtures from Utility	$1.00	3
Price of new LED Fixtures	$78,839	4
Price of Installation	$26,025	5
Estimated Utility Incentive	-$16,188	6
DOER Green Community Grant		
Total NET Price	$88,677	
Savings / Yr	$35,441	
Avg annual simple return on net investment	40%	
Simple Payback (years)	2.5	

NOTES:

Grey cells: information still needed

1. Utility Expenses: from supplied utility bill and Eversource's posted Summary of Rates
2. Existing Maintenance: included in current bill
3. Purchase price from Eversource 1/19/16
4. Budget Pricing. Includes long-life photocell
5. Installation Estimate
6. Estimated incentive based on $.25 per KWH SAVED

Fixtures priced are:

- Available in both 3000k and 4000k
- smart control ready

LED STREETLIGHT REPLACEMENT
TOWN OF MEDFIELD

PROJECT ESTIMATE DETAILS

EXISTING										PROPOSED										
Type	Qty	Wattage (including Ballast) per Fixture	Wattage (including Ballast) Ext	Annual kWh per Fixture	Annual kWh Ext	Annual Fixed Charges per Fixture	Annual Fixed Charges Extended	Annual Total Charges per fixture	Annual Total Charges Ext	Fixture Style	Model #	Budget Price	Extended price	Watts	Watts Extended	Watts saved per Fixture	Annual kWh	Annual kWh SAVED	Annual charges Extended	Estimated Incentive @.25 per KWH SAVED
250 Watt MV	1	296	296	1243	1243	$133.56	$133.56	$268	$268	XSP1 C	XSPCHT*E*UL*QR – 7PIN	$291	$291	60	60	236	252	991	$42	$248
250 Watt MV	1	296	296	1243	1243	$317.16	$317.16	$452	$452	XSP1 C	XSPCHT*E*UL*QR – 7PIN	$291	$291	60	60	236	252	991	$42	$248
35 Watt HPS	166	41	6806	172	28585	$79.56	$13,206.96	$98	$16,298	XSPRB 19w	XSPRBHT*A*UL*QR – 7PIN	$198	$32,868	19	3154	22	13247	15338	$2,195	$3,835
50 Watt HPS	80	58	4640	244	19488	$83.76	$6,700.80	$110	$8,808	XSPRB 24w	XSPRBHT*A*UL*QR – 7PIN	$198	$15,840	24	1920	34	8064	11424	$1,336	$2,856
100 Watt HPS	75	117	8775	491	36855	$96.00	$7,200.00	$149	$11,185	XSPRB 39w	BXSPRAO*F/M-CUS – 7PIN	$198	$14,850	39	2925	78	12285	24570	$2,035	$6,143
100 Watt HPS	1	117	117	491	491.4	$150.00	$150.00	$203	$203	XSPRB 39w	BXSPRAO*F/M-CUS – 7PIN	$198	$198	39	39	78	164	327	$27	$82
150 Watt HPS	18	175	3150	735	13230	$107.64	$1,937.52	$187	$3,368	XSP1 C	XSPCHT*E*UL*QR – 7PIN	$291	$5,238	60	1080	115	4536	8694	$752	$2,174
150 Watt HPS	2	175	350	735	1470	$162.00	$324.00	$241	$483	XSP1 C	XSPCHT*E*UL*QR – 7PIN	$291	$582	60	120	115	504	966	$84	$242
150 Watt HPS	2	175	350	735	1470	$269.52	$539.04	$349	$698	XSP1 C	XSPCHT*E*UL*QR – 7PIN	$291	$582	60	120	115	504	966	$84	$242
150 Watt HPS	1	175	175	735	735	$291.24	$291.24	$371	$371	XSP1 C	XSPCHT*E*UL*QR – 7PIN	$291	$291	60	60	115	252	483	$42	$121
	347		24955		104811		$30,800		$42,132				$71,031		9538		39808	63759	$6,692	$16,188
										Long life Photo cell		$22.50	$7,807.50							

RATES USED ABOVE			
Retail Delivery Rates			
Customer Charge		$8.02000 *per month*	Source: Eversource Summary of Rates effective 1/1/16
S2		$0.06140 *per KWH*	Source: Eversource Summary of Rates effective 1/1/16
S1	---		Source: Fixed charges from S1 rate effective 1/1/16
Rate Adjustments		$0.00384 *per KWH*	Source: Eversource Summary of Rates effective 1/1/16
Electrical Supply:			
		$0.10428 *per KWH*	Source: avg of posted variable rates from Eversource Summary of Rates effective 1/1/16

OTHER NOTES:

Existing watts from S1 rate chart

Annual Hours: 4200

X. Appendix F: MMBTU Conversion Chart – DOER

MMBTU Conversion Chart[1]

Fuel Energy Content of Common Fossil Fuels per DOE/EIA

BTU Content of Common Energy Units – (1 million BTU equals 1 MMBTU)

- 1 kilowatt hour of electricity = 0.003412 MMBTU
- 1 therm = 0.1 MMBTU
- 1 ccf (100 cubic foot) of natural gas = 0.1028 MMBTU (based on U.S. consumption, 2007)
- 1 gallon of heating oil = 0.139 MMBTU
- 1 gallon of propane = 0.091 MMBTU
- 1 cord of wood = 20 MMBTU
- 1 gallon of gasoline = 0.124 MMBTU (based on U.S. consumption, 2007)
- 1 gallon of E100 ethanol = 0.084 MMBTU
- 1 gallon of E85 ethanol = 0.095 MMBTU
- 1 gallon of diesel fuel = 0.139 MMBTU
- 1 gallon of B100 biodiesel = 0.129 MMBTU
- 1 gallon of B20 biodiesel = 0.136 MMBTU[2]
- 1 gallon of B10 biodiesel = 0.137 MMBTU[7]
- 1 gallon of B5 biodiesel = 0.138 MMBTU[7]
- 1 barrel of residual fuel oil = 6.287 MMBTU

[1] If a conversion factor for a fuel you use is not provided, please contact DOER.

[2] Calculated Values from those of diesel and B100 biodiesel