



# Lighting! RCM Action! Retrofits!

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WSU Energy Resource Conservation Manager Program

January 18, 2018



## Energy Program

WASHINGTON STATE UNIVERSITY

# WSU Energy RCM Program

The WSU Energy Program promotes and supports energy efficiency at public and government facilities in Washington State through the Resource Conservation Manager (RCM) program.

# WSU Support for RCMs

- Monthly RCM Newsletter
- Webinars
- Technical assistance
- RCM hiring assistance
- Instrument and tool loan program
- Website resources (to be updated)
- Training upon request
- Conference scholarships

# Resource Conservation Management

- Coordinated effort to manage
  - Energy and water used
  - Waste generated
- Reduces operating costs
- Increases efficiency
- Promote environmentally friendly operations.
- Enhances occupant comfort

# **Don't have an RCM program? Let us help you start one!**

Attend the Webinar

**“What is an RCM and Why Do I Need One?”**

Wednesday, February 28, 2018

12:00 to 1:00 PM Pacific

Register at

<https://attendee.gotowebinar.com/register/1835521801030429441>

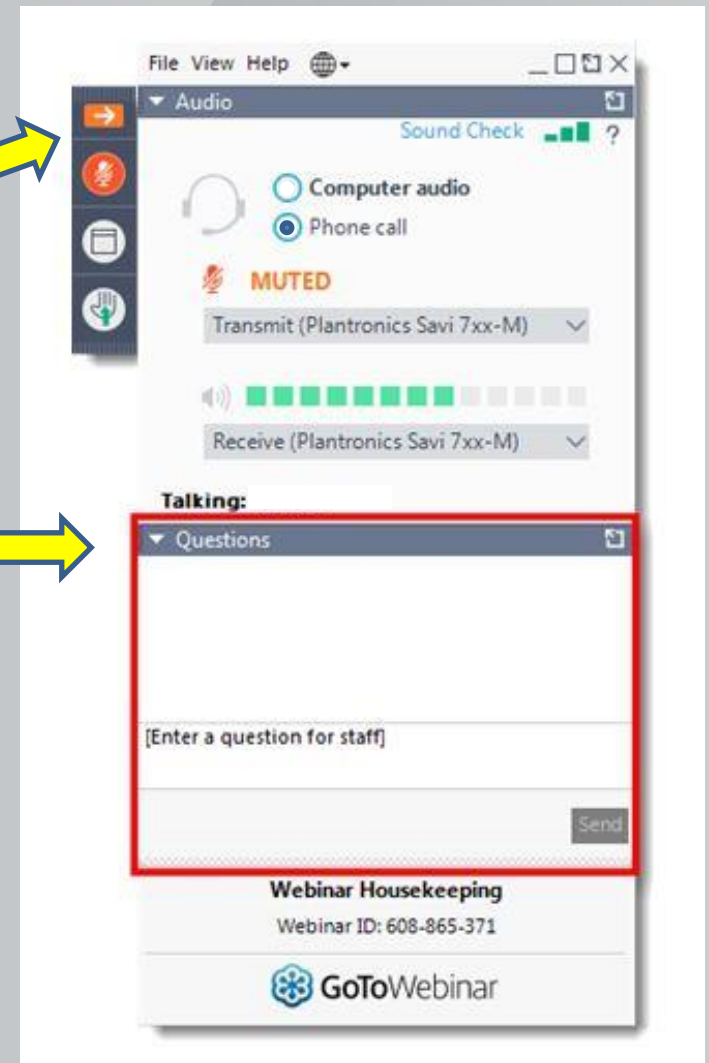
or

Call or email Karen to discuss!

360-956-2096, [janowitzk@energy.wsu.edu](mailto:janowitzk@energy.wsu.edu)

# GoToWebinar Logistics

- Minimize or maximize control panel
- Phone lines are muted
- **Please use question pane to ask questions at any time, or if you have any technical issues**



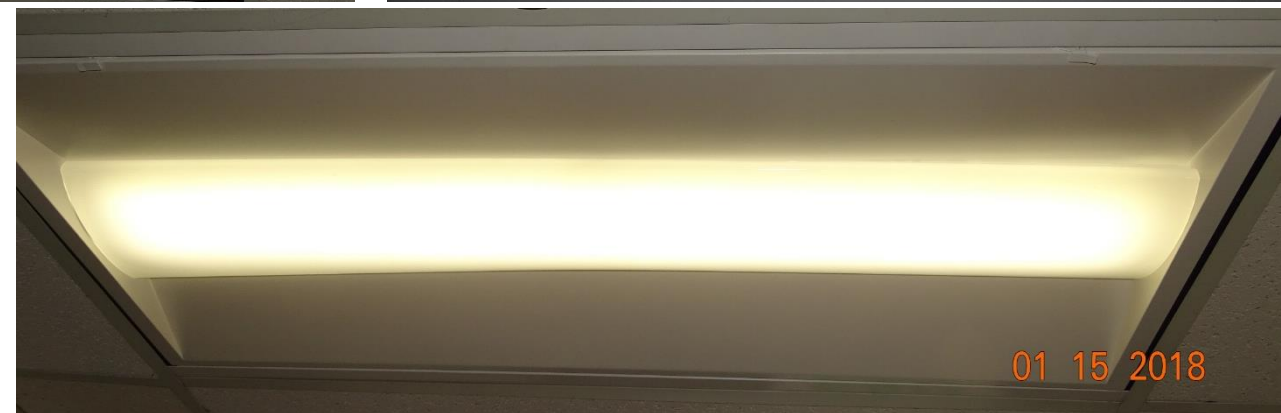
Today's presentation is being recorded  
and will be available at  
<http://www.energy.wsu.edu/PublicFacilitiesSupport/ResourceConservation.aspx>

# LED Lighting in the Issaquah School District

Chris Bruno



# First LED retrofit (a small step)





# The next retrofit (a little bit bigger step)

## Criteria:

- Low cost per fixture
- Install in-house
- Install at every school
- Max three year payback

## LED type selected: ballast compatible (plug-and-play)

- Compatible with ~200 fluorescent ballasts
- Rebates provided through electric utility
- Aluminum heat sink and plastic cover
- *Great quality light!*

## Fixture type and areas targeted

- Recessed troffer w/ cover (2 or 3 lamp)
- All portable buildings
- One elementary school (recently retrofit to T8 from T12)
- *\*\*show excel table and project proposals\*\**



# Data Collection: ~3,600 cells

building	area or room number	fixture type	cover type	# of fixtures	# of lamps per fixture	total lamps	type of tube/bulb	ballast brand	model number	ballast startup type	fixture wattage	total wattage	yearly hours of operation	cost (\$/kWh)	yearly cost
administration	portable 1A-1B	recessed	acrylic	25	2	50	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	1,185	1,400	0.097521	\$162
administration	portable 1A-1B conference	recessed	acrylic	2	2	4	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	95	1400	0.097521	\$13
administration	portable 1A-1B office Wright	recessed	acrylic	4	2	8	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	190	1400	0.097521	\$26
administration	portable 2A	recessed	acrylic	4	2	8	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	190	1400	0.097521	\$26
administration	portable 2B	recessed	acrylic	4	2	8	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	190	1400	0.097521	\$26
administration	portable 3A main area	recessed	louvers	10	3	30	T8 - F32 (4')	Advance Centium	VCN-2S32-SC (277V/60Hz ONLY)	programmed rapid	36	360	1400	0.097521	\$49
administration	portable 3A main area							MagneTek Triad	B332R277HP (277V/60Hz ONLY)	rapid	94	942	1400	0.097521	\$129
administration	portable 3A office Nourigat	recessed	louvers	2	2	4	T8 - F32 (4')	Sylvania Quicktronic	QHE 2x32T8/UNV ISN-SC	instant	62	125	1400	0.097521	\$17
administration	portable 3A office Archer	recessed	louvers	2	2	4	T8 - F32 (4')	Sylvania Quicktronic	QHE 2x32T8/UNV ISN-SC	instant	62	125	1400	0.097521	\$17
administration	portable 3A office Crawford	recessed	louvers	2	2	4	T8 - F32 (4')	Sylvania Quicktronic	QHE 2x32T8/UNV ISN-SC	instant	62	125	1400	0.097521	\$17
administration	portable 3A office	recessed	louvers	2	2	4	T8 - F32 (4')	Sylvania Quicktronic	QHE 2x32T8/UNV ISN-SC	instant	62	125	1400	0.097521	\$17
administration	portable 3A office Mullins	recessed	louvers	2	2	4	T8 - F32 (4')	Sylvania Quicktronic	QHE 2x32T8/UNV ISN-SC	instant	62	125	1400	0.097521	\$17
administration	portable 3B	recessed	louvers	2	2	4	T8 - F32 (4')	Sylvania Quicktronic	QHE 2x32T8/UNV ISN-SC	instant	62	125	1400	0.097521	\$17
administration	portable 4A-4B main area	recessed	acrylic	13	2	26	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	616	1400	0.097521	\$84
administration	portable 4A-4B office Grutius	recessed	acrylic	1	2	2	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	47	1400	0.097521	\$6
administration	portable 4A-4B office Grutius	recessed	acrylic	1	2	2	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	47	1400	0.097521	\$6
administration	portable 4A-4B office Best	recessed	acrylic	2	2	4	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	95	1400	0.097521	\$13
administration	portable 4A-4B office Barnhart	recessed	acrylic	3	2	6	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	142	1400	0.097521	\$19
administration	portable 4A-4B office Borninkhof	recessed	acrylic	2	2	4	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	95	1400	0.097521	\$13
administration	portable 4A-4B office Kaluza	recessed	acrylic	2	2	4	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	95	1400	0.097521	\$13
administration	portable 4A-4B office Winslow	recessed	acrylic	2	2	4	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	95	1400	0.097521	\$13
administration	portable 4A-4B office (unlabeled)	recessed	acrylic	2	2	4	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	95	1400	0.097521	\$13
administration	portable 4A-4B bathroom	recessed	acrylic	1	2	2	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	47	1400	0.097521	\$6
administration	portable 5A-5B main area	recessed	acrylic	13	2	26	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	616	1400	0.097521	\$84
administration	portable 5A-5B main area	recessed	acrylic	3	2	6	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	47	142	1400	0.097521	\$19
Apollo Elementary	portable P1 (SAC)	recessed	acrylic	8	2	16	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-SC	programmed	57	456	1400	0.064284	\$41
Apollo Elementary	portable P2 (SAC)	recessed	acrylic	8	2	16	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-SC	programmed	57	456	1400	0.064284	\$41
Apollo Elementary	portable P3	recessed	acrylic	16	2	32	T8 - F32 (4')	Sylvania Quicktronic	QTP 2x32T8/UNV ISN-SC	instant	57	912	1400	0.064284	\$82
Apollo Elementary	portable P4	recessed	acrylic	16	2	32	T8 - F32 (4')	Sylvania Quicktronic	QTP 2x32T8/UNV ISN-SC	instant	57	912	1400	0.064284	\$82
Apollo Elementary	portable P5	recessed	acrylic	16	2	32	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	45	720	1400	0.064284	\$65
Apollo Elementary	portable P6	recessed	acrylic	16	2	32	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	45	720	1400	0.064284	\$65
Apollo Elementary	portable P7	recessed	acrylic	16	2	32	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	45	720	1400	0.064284	\$65
Beaver Lake Middle	portable A	recessed	acrylic	16	2	32	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	45	720	1400	0.064284	\$65
Beaver Lake Middle	portable B	recessed	acrylic	16	2	32	T8 - F32 (4')	Philips Optanium	IOP 2PSP32-LW-SC	programmed	45	720	1400	0.064284	\$65

# Data Analysis: Pivot tables are \*two thumbs up\*

Dynamic Filter by Ballast

Ballast Model Number	# of Ballasts
B232IUNVHP-A	
ICN 2P32-N	
IOP 2PSP32-LW-SC	
IOP 2PSP32-SC	
IOPA 2P32-LW-SC	
IZT 2S32-SC	
IZT 3PSP32-SC	
QHE 1x32T8/UNV ISN-SC	
QHE 2x32T8/UNV ISN-SC	
QTP 2x32T8/UNV ISN-SC	
QTP 2x32T8/UNV PSN-TC	
QTP 3x32T8/UNV ISN-SC	
VCN-2S32-SC (277V/60Hz ONLY)	
(blank)	
B332R277HP (277V/60Hz ONLY)	

Dynamic Filter by Site

Site	sub-sorted by ballast type		sub-sorted by portable			
	Fixtures	Lamps	Fixtures	Lamps		
administration	Clark Elementary	266	586	Clark Elementary	266	586
Apollo Elementary	IOP 2PSP32-LW-SC			portable P1	16	32
Beaver Lake Middle	portable P1	16	32	IOP 2PSP32-LW-SC	16	32
Briarwood Elementary	portable P13	16	32	portable P10	14	28
Cascade Ridge Elementary	portable P14	16	32	IZT 2S32-SC	4	8
Challenger Elementary	portable P2	16	32	QTP 2x32T8/UNV ISN-SC	10	20
Clark Elementary	portable P3	16	32	portable P11	14	28
Cougar Ridge Elementary	portable P4	16	32	IZT 2S32-SC	4	8
Creekside Elementary	portable P5	16	32	QTP 2x32T8/UNV ISN-SC	10	20
Discovery Elementary	portable P6	16	32	portable P12	14	28
Endeavour Elementary	IZT 2S32-SC			IZT 2S32-SC	4	8
Grand Ridge Elementary	portable P10	4	8	QTP 2x32T8/UNV ISN-SC	10	20
Issaquah High	portable P11	4	8	portable P13	16	32
Issaquah Middle	portable P12	4	8	IOP 2PSP32-LW-SC	16	32
Issaquah Valley Elementary	portable P7	4	8	portable P14	16	32
Liberty High	portable P8	4	8	IOP 2PSP32-LW-SC	16	32
Maple Hills Elementary	portable P9	4	8	portable P15	9	27
Maywood Middle	IZT 3PSP32-SC			IZT 3PSP32-SC	2	6
Newcastle Elementary	portable P15	2	6	QTP 3x32T8/UNV ISN-SC	7	21
Pacific Cascade	portable P16	2	6	portable P16	9	27
Pine Lake Middle	portable P17	2	6	IZT 3PSP32-SC	2	6
Skyline High	portable P18	2	6	QTP 3x32T8/UNV ISN-SC	7	21
Sunny Hills Elementary	portable P19	2	6	portable P17	9	27
Sunset Elementary	portable P20	2	6	IZT 3PSP32-SC	2	6
	QTP 2x32T8/UNV ISN-SC			QTP 3x32T8/UNV ISN-SC	7	21
	portable P10	10	20	portable P18	9	27
	portable P11	10	20	IZT 3PSP32-SC	2	6
	portable P12	10	20			
	portable P7	10	20			
	portable P8	10	20			
	portable P9	10	20			
	QTP 3x32T8/UNV ISN-SC					

# Make the proposal and wait for approval...



Prepared by Chris Bruno  
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253-929-9810

## PROJECT PROPOSAL: LED LIGHTING FOR ALL PORTABLES (5,400 LAMPS IN 200 CLASSROOMS)

July 11, 2016

### OVERVIEW

#### 1. Project Description

Install LED lamps in portable classrooms' ceiling fixtures. All rooms have the same fixture and lens type, and all fluorescent ballasts have been tested compatible with the LEDs. Since the ceilings are low and the new lamps are compatible in the existing fixtures, no special equipment is needed or electrical work required. Custodians simply take out a fluorescent light and replace it with a new LED tube.

#### 2. Project Scope

Every portable building. They're ideal for a lighting upgrade because they all have ceiling-recessed troffer fixtures with acrylic lens covers. These fixtures are good for LEDs because the lens scatters the light for good illumination. Plus, since they are in low ceilings they can be reached with a step ladder.

1: Double-click the icon to open attachment in Microsoft Excel.



portables lighting  
inventory

#### 3. Non-Financial Resource Requirements

Logistics are difficult because every school is affected. Instead of directing every lead custodian to install the lights at his/her school, one small group should be selected to do all the work. The work should be done separately from regular duties so work hours can be tracked, and the data can be used to make labor estimates for future projects.

#### 4. Financial Requirements

- Disposal of old fluorescent lamps (sunk cost). The scrub crew will begin collecting lamps from schools every six months, starting in September. The fluorescents can be stored at each school to be picked up in September or March. At a cost of \$0.50 per lamp, disposal will be about \$2,600 but the maintenance department will pay that expense.



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- Installation. For a basic estimate assume two custodians do all the work and each person needs an average of one minute per fixture. There are 2,614 fixtures requiring about 45 hours from each person, or 90 labor hours total.
- LED lamps. Puget Sound Energy rebates \$6 per lamp and the discount is included in the price. See attached quote:

2: Double-click the icon to open attachment in Adobe Acrobat Reader.



LED lamp quote

Funding Source	Account Number(s)	Amount
N/A	N/A	\$2,600 (sunk cost for disposal)
		\$ ???? (90 hours at custodial overtime rate)
		\$ 16,725 (cost of LED lamps)

#### 5. Deliverables

- Better lighting in the classrooms. Some teachers get headaches from fluorescent lighting, an issue that will disappear with LEDs. The classroom environment will have better quality lighting for better quality learning.
- Smaller power bills. Some portables are separately metered and their bills will be tracked after the lights are installed.

#### 6. Implementation Plan

With one pair of custodians the work might take around one week to complete but two pairs could finish in about three days. If the project ~~can't~~ be done this summer it can be scheduled for the next school break.

- Custodians install LEDs at the schools
- Fluorescents are added to each school's stockpile of burned out lamps



Prepared by Chris Bruno  
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#### 7. Timeline/Schedule

- Lamps ordered. Estimated delivery time: 2 to 3 weeks
- Schedule custodians' time
- Installation

### APPROVAL AND AUTHORITY TO PROCEED

We approve the project as described above, and authorize the team to proceed.

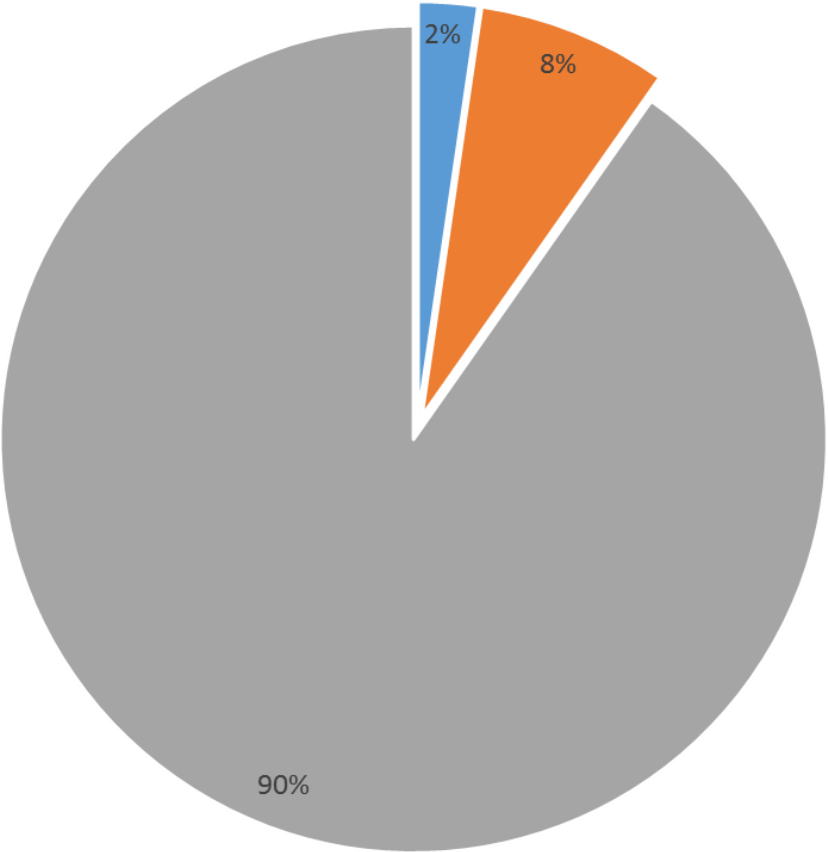
Approved By \_\_\_\_\_ Date \_\_\_\_\_ Approved By \_\_\_\_\_ Date \_\_\_\_\_







Total Floor Space: 2.6 million square feet



■ Discovery Elementary   ■ all portables   ■ everything else

# The Install: It always works *exactly* as planned...

## Wait times

1.5 months for project approval  
3 months for delivery

## Personnel turnover

Four lead custodians resigned  
No substitute pool  
Route vacancies up to 30%

## Fire!





# The Install: It helps to be flexible

Original plan: replace all lights in a single school

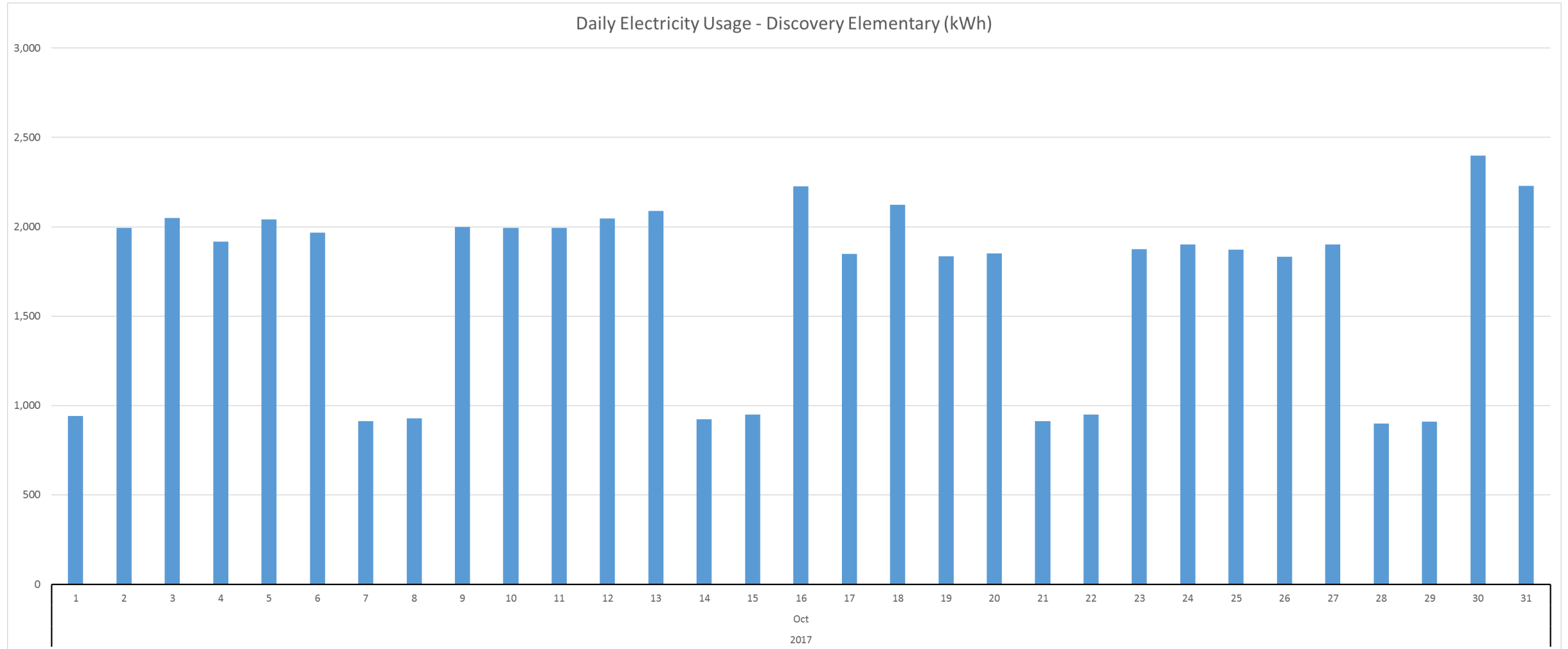
- Requires many people
- Requires a lift

Revised plan: replace classroom, office, and hallway lights in two schools

- Only needs one person



# Benefits: reduced usage



# Benefits: quality lighting



# Extra Benefits:

Fluorescent lamp collection now scheduled 2x per year

High school cafeteria accent lighting upgraded to LED

One new major LED project each year

- Next project: exterior lighting at a high school

# Contact

Chris Bruno

Resource Conservation Manager

Issaquah School District 411

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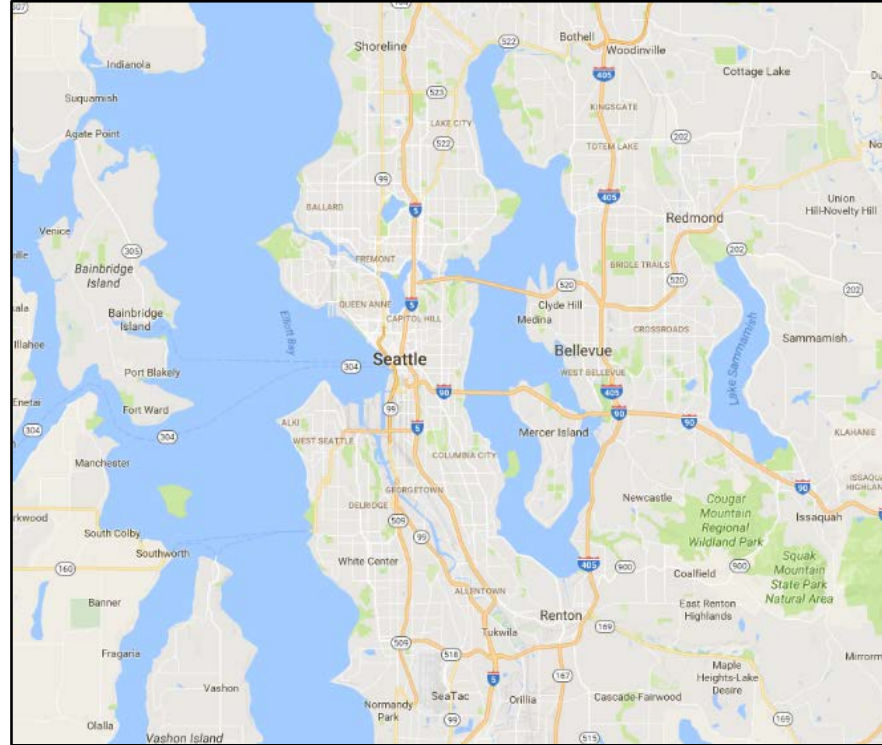




# Seattle Schools Sustainable Lighting Designs

**Bonnie Meyer Resource Conservation Specialist**  
**Rina Fa'amoe Cross Resource Conservation Specialist**





Seattle Pubic Schools is the largest district in the state.  
103 schools housing nearly 54,000 students, 6,300  
staff and teachers in over 10 million square feet.



# Topics

- Making Choices
- How we do what we do
  - Technical Standards
  - Design Process
  - Partners
- Criteria for choosing fixtures and lamps
- Unexpected Influences to Anticipate
- Things to watch out for

# Making Choices

We all make choices everyday , it looks like most people choose chocolate doughnuts.

We want to be mindful of our thought processes and make decisions based on **data**, experience, best practices by reading the **original source materials and actual studies to decide the best choices.**

We will show how we make the best lighting choices and the challenges that we face.





## Help Making Choices in Lighting

- In-House Electricians and Custodians- good experience
- Lighting Design Lab – Provides- classes, samples, advice
- Seattle City Light – Electric Utility – Advice and rebates and incentives
- WSU Energy Program- Assistance

# SEATTLE SCHOOL DISTRICT TECHNICAL BUILDING STANDARDS

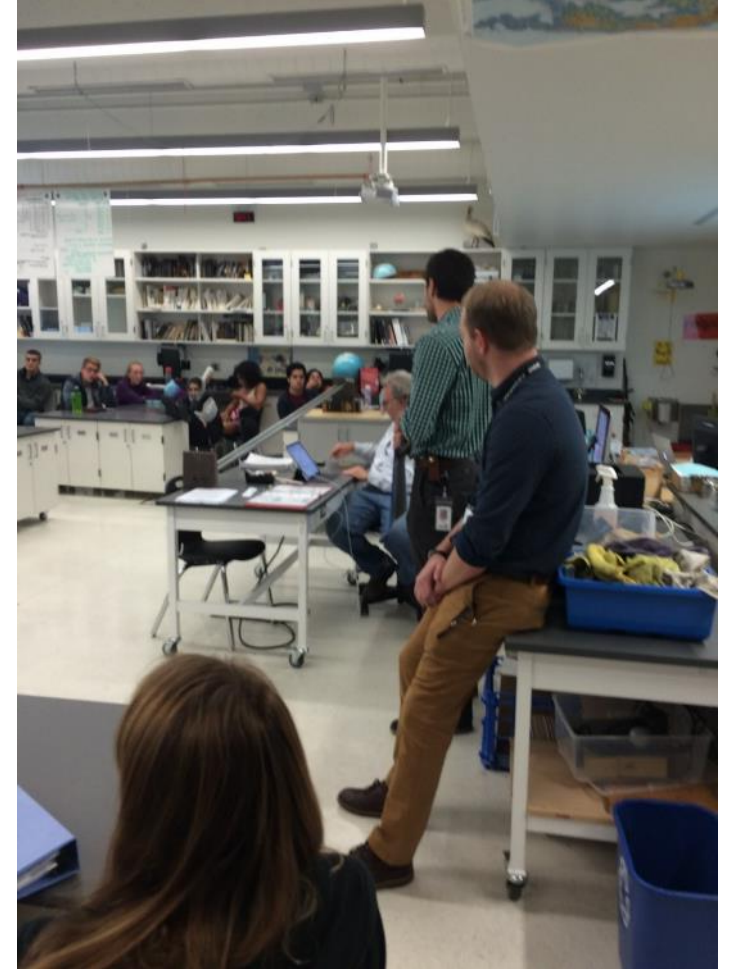
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## J. WASHINGTON SUSTAINABLE SCHOOLS PROTOCOL (WSSP)

1. General: The Owner has established environmental and high performance goals. Design to meet WSSP High Performance School Rating System.

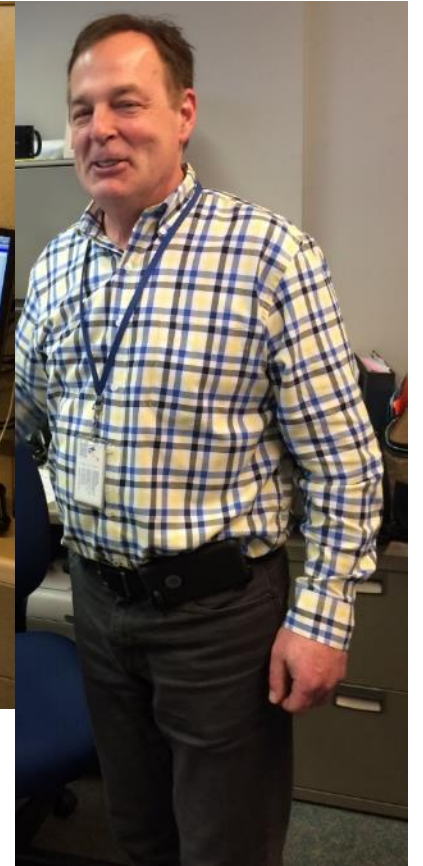
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# Each project includes an Integrated Design Team and WSSP Meetings with architects, engineers and school Capital and Facility Operations staff

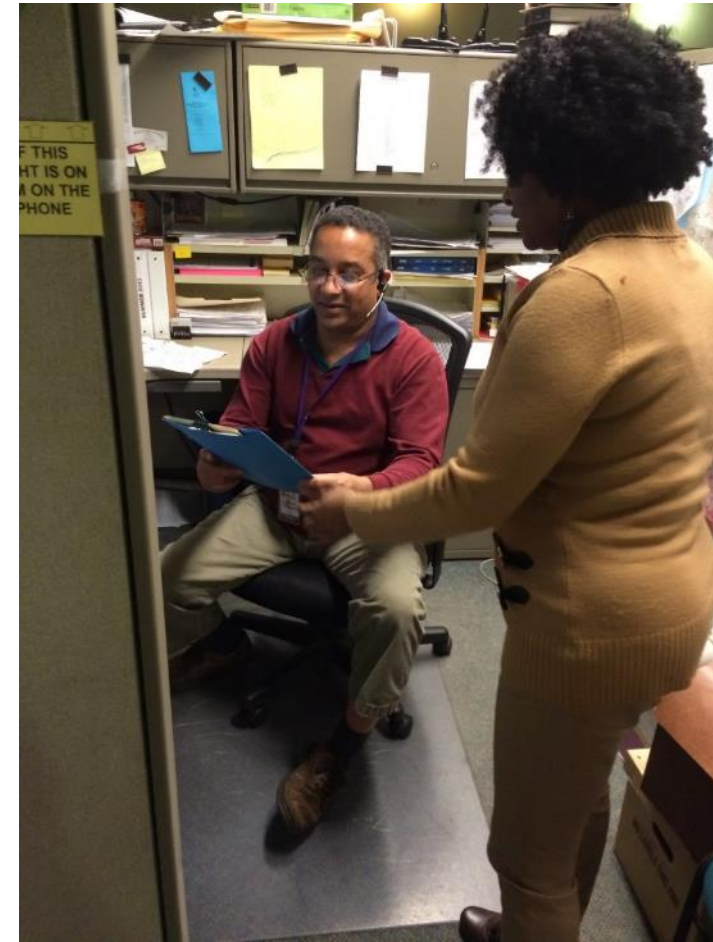




# Teamwork



- Mechanical Coordinator Mike McBee and Mike Kennedy. Work to help designs meet standards.
- Fernando Luna monitors controls including lighting at 100 buildings and supervises repairs crews.
- Frank Griffin coordinates extensive preventive maintenance.

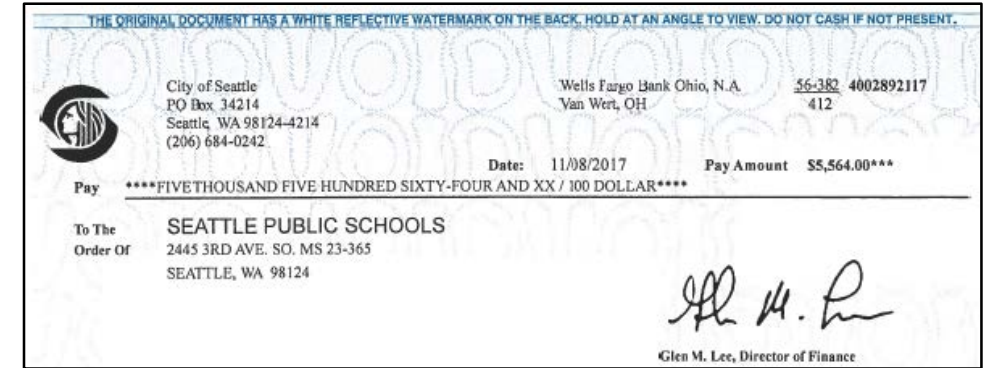


**Coordinate with Self- Help Group, Buildings Rental and Custodial Services.  
Discover: IS a mural planned? Has a room been converted into a yoga studio?  
What are paint standards; switching behaviors; preferences; and the latest fads.**



# Seattle City Light Rebates and Incentives help make retrofits worthwhile

Estimated annual cash savings: \$6,804			
Estimated cost after incentives: \$51,294			
<b>Estimated Seattle City Light Incentive: \$13,852</b>			
Estimated Incentive as a Percent of Cost: 21%			
Estimated Simple Payback: 7.5			
Estimated ROI: 13%			
Greenhouse Gas Reduction: 51 tons			
Project Cost	Estimated SCL Incentive Amount	Estimated Electricity Savings kWh/year	Estimated Electricity Savings \$/year
1,477	\$ 5,234	47,580	\$ 3,806
63,669	\$ 8,618	37,471	\$ 2,998

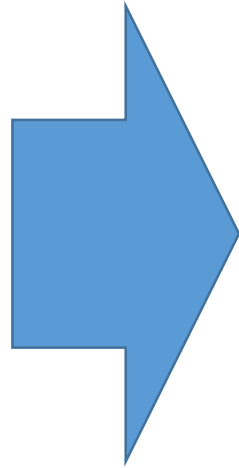


. Advisors help select the best products. We still use the DLC (Design Lights Consortium) list to make sure products have passed rigorous tests.

Most lighting projects have a quick return on investment, even without the savings we enjoy from reduced maintenance and replacement costs.

# Criteria for Choosing Fixtures and Lamps

1. Light Quality
2. Choose most durable lamps and fixtures
3. Can be maintained with current resources
4. Appearance
5. Easy to use



1. 3500 K and CRI over 80
2. Test sample and look at existing durability
3. Can be maintained with current resources
4. Respect architectural details
5. Easy to use

# 1. Light Quality

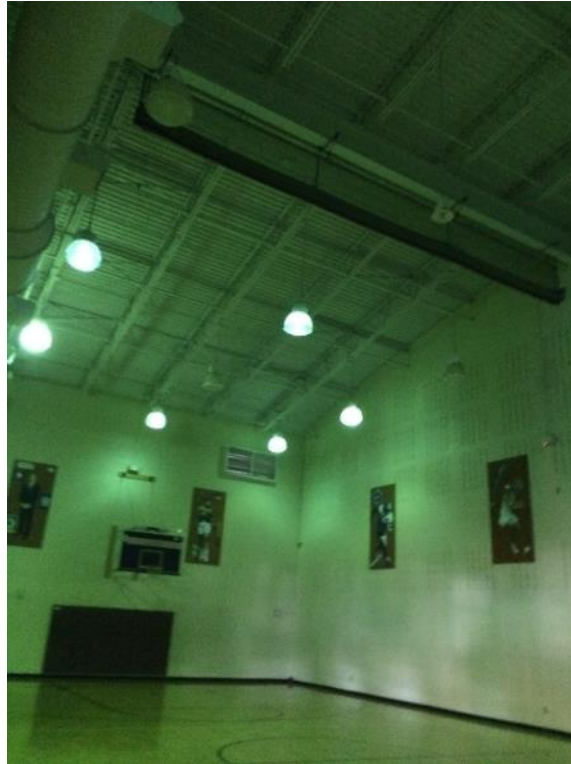
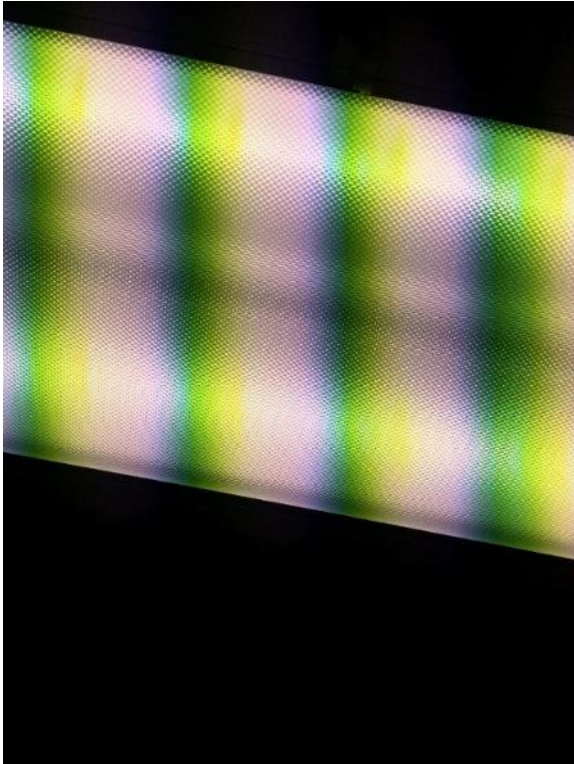


Photo shows flickering lamp Old gym has HID lamps that appear green

- No flickering- check with your phone camera
- Consistent color temperatures – check samples, LEDs tend to be bluer than other types so might select a lower color temperature
- We want excellent color rendering
- Smoother dimming to meet code and avoid distracting from learning

## 2. Choose most durable lamps and fixtures



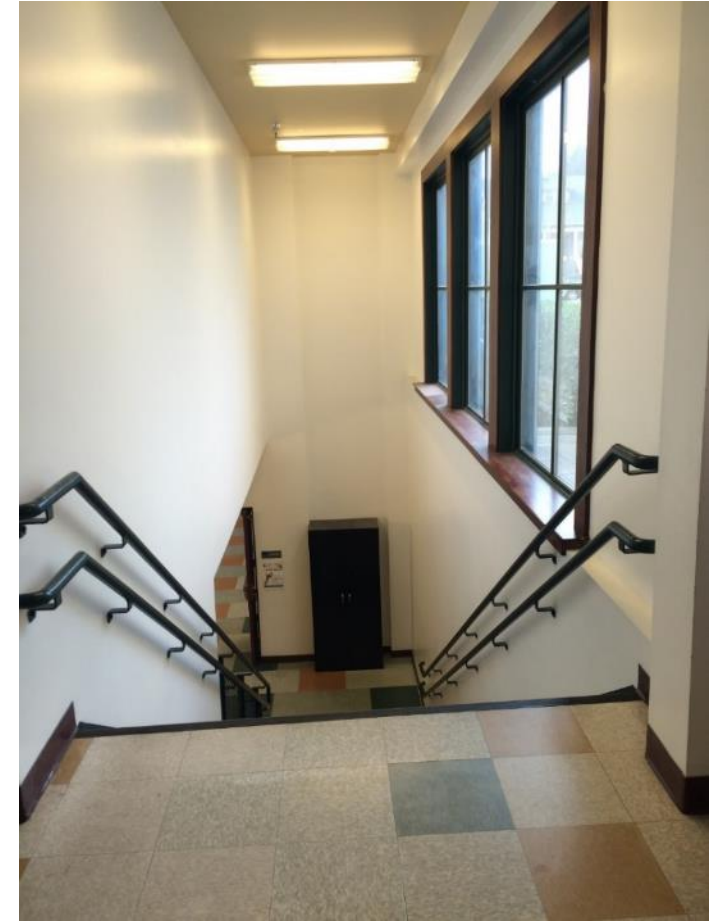
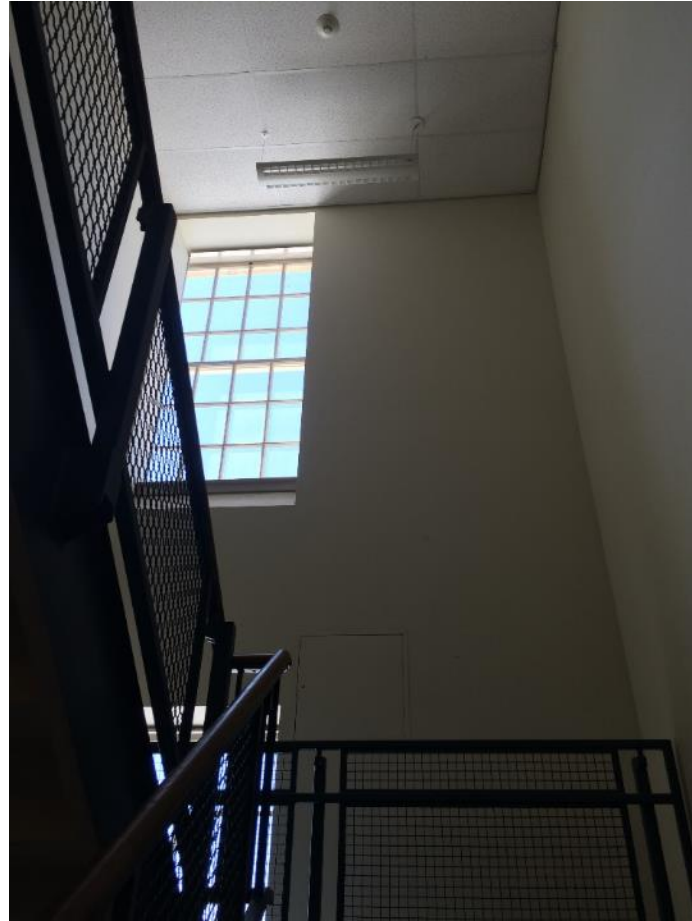
This LED fixture caught fire. See the frayed cord. The manufacture replaced it and the rest of the installed fixtures.

Here is an LED parking lot light that we inspected before installation to make sure what we purchased is what we later received



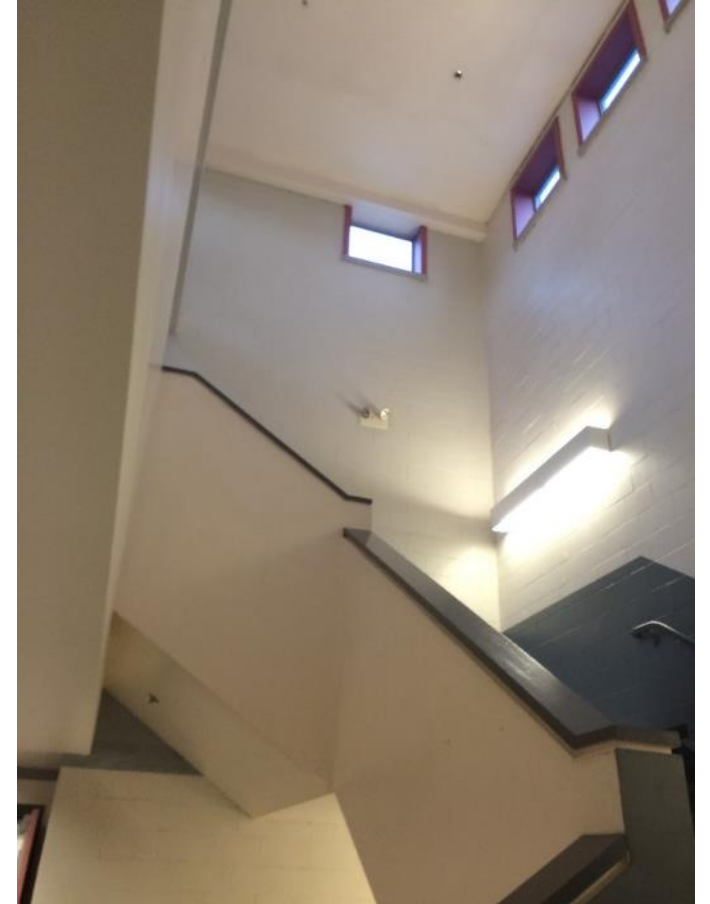
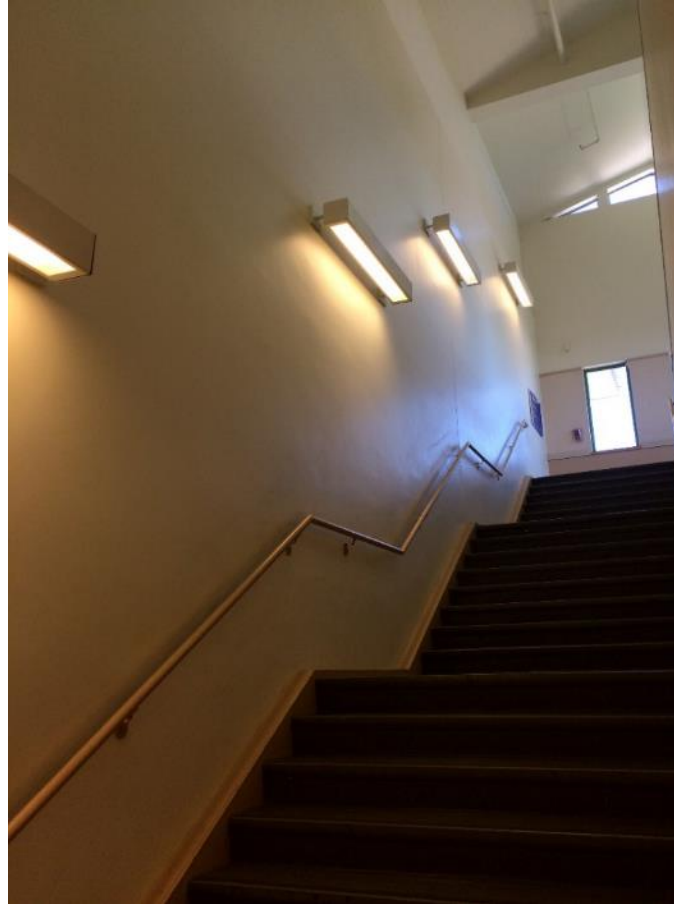
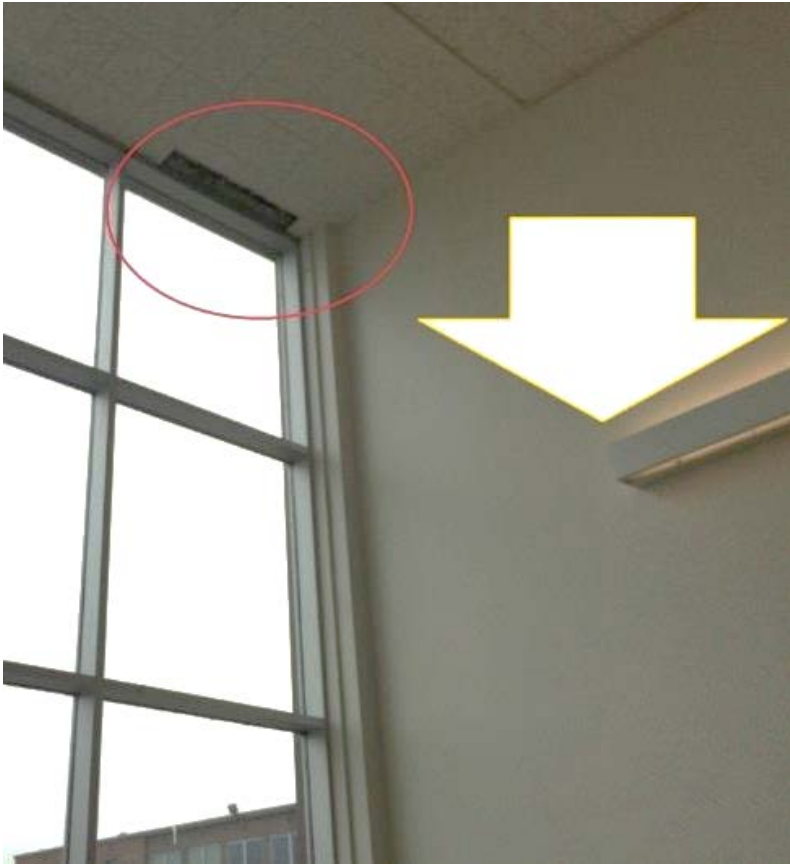
### 3. Can be maintained with current resources

## Example of lights too high to service



### 3. Can be maintained with current resources

Light was mounted too high. Replacement is at proper height but scars remain. **Better** to place fixtures low from the start.



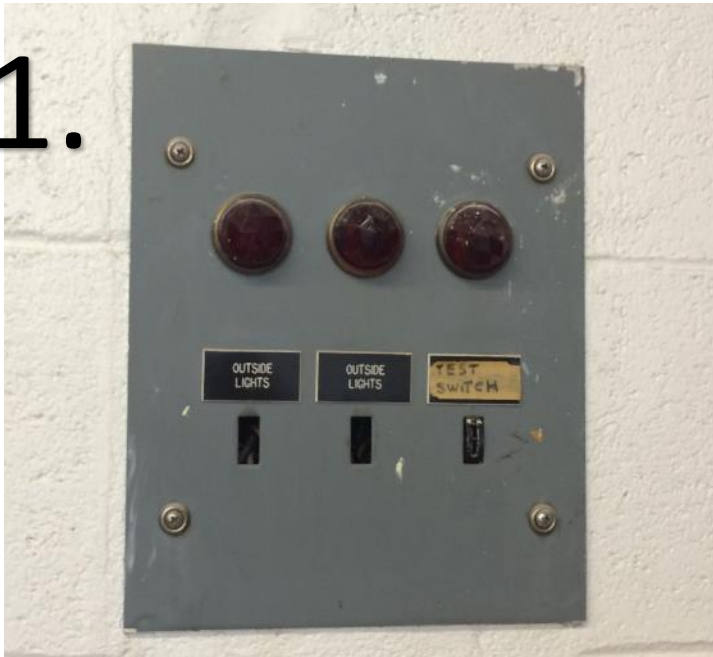
## 4. Appearance

Clear communication so users help save energy – use plastic stickers or engravings





1.



2.



3.



4.



1. In the Beginning we had two switches
2. Then we got a little more complicated four switches with color codes
3. Then each room had a few. On or OFF.
4. Then we got more elaborate. Until no-one knows which does what. Labels help.

## 5. Easy to Use

Our new specifications are this model switch.  
Up for on, down for off.  
Stays in the center because it integrates a vacancy sensor.



# 5. Easy to Use Controls and Lighting Design Should Work

- Follow foot candle requirements
- Commission during
- Commission after
- There is always something left to find and fix
- Here are a few examples

Lighting Standards in FC (foot candles)			Maximum five (5) lamp types		
Area	Reference	Min. Standard	DRAFT SPS Tech Standard	Owners Req	IESNA
Auditorium	246-366-120(1)	10	30 up to 45		10
Lunch room	246-366-120(1)	10		15	30
Assembly area	246-366-120(1)	10			10
Toilet	246-366-120(1)	10	25	10	5-15
Store Rooms	246-366-120(1)	10	25	20	
Corridors	246-366-120(1)	10	25	15	10-20
Stairs	246-366-120(1)	10			15
Gyms	246-366-120(1)	20	30 - 45 Compete 80	40 - HS 50 COMPETITION	30-75
Showers	246-366-120(1)	20	25		
Locker rooms	246-366-120(1)	20	25		10
Kitchens	246-366-120(1)	30	60	50	30-50
Food Storage	246-366-120(1)	30	25	20	
Food Prep	246-366-120(1)	30	60		
Classrooms/Study Halls	246-366-120(1)	30	45	40	30-50
Lecture Rooms	246-366-120(1)	30		40	
Libraries	246-366-120(1)	30	60	40	30-50

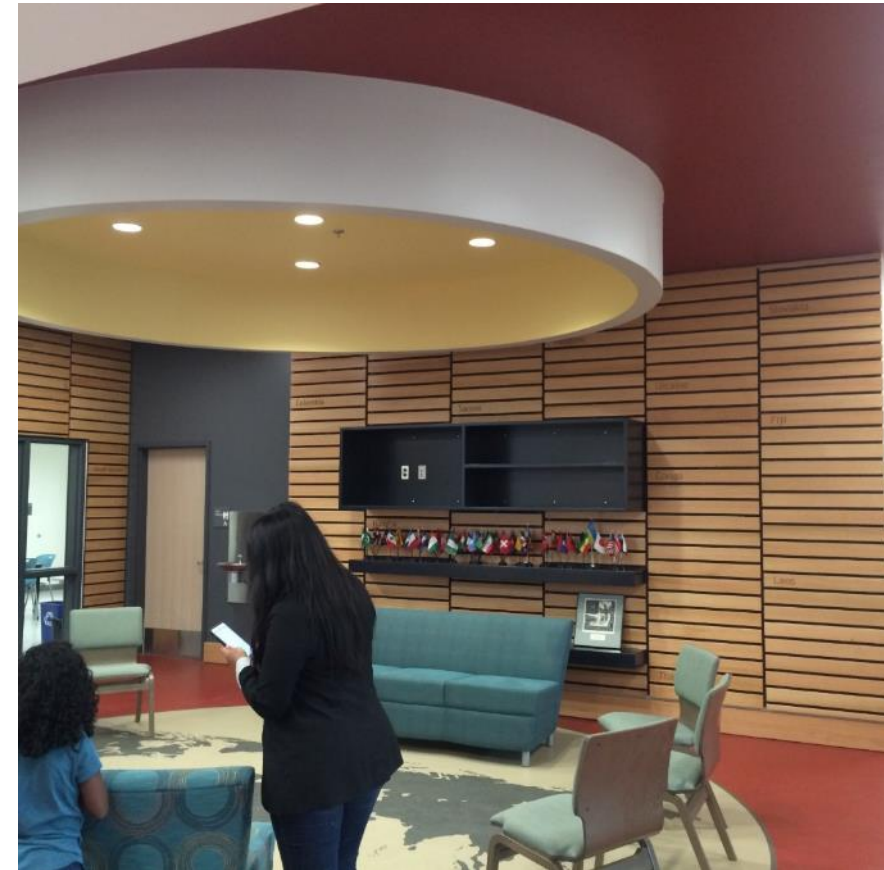
# Unexpected Influences to Anticipate



**Do you see a musician or a girl's face?**



# Before and after: Ceiling and floor coloring changes light impact



# Case Study, gym before and after

New LED fixtures – But next painted ceiling dark green!





New School – One room with light levels from 15 to 100 foot candles. Dimming doesn't work when pointed wrong way and out of the box non-dimmed lamps were too bright



Examples of new school in spring when we did second round of commissioning  
Controls issues and product out of the box need adjustment before installation

15 fc



100 fc

Exercise rooms often have black floors. The light is absorbed by the floor.





# Getting the right amount of light

## 100 fc right for surgery not 1<sup>st</sup> grade



# Cafeteria in a Historical Building



This room is bright during a sunny day. But lighting can only be located on the rafters high above the tables. We cannot change the lighting since like 30% of our buildings it has landmark status and cannot be changed. Light is only at the top – floor and table tops are too dark.



# Case Study Garfield Gyms



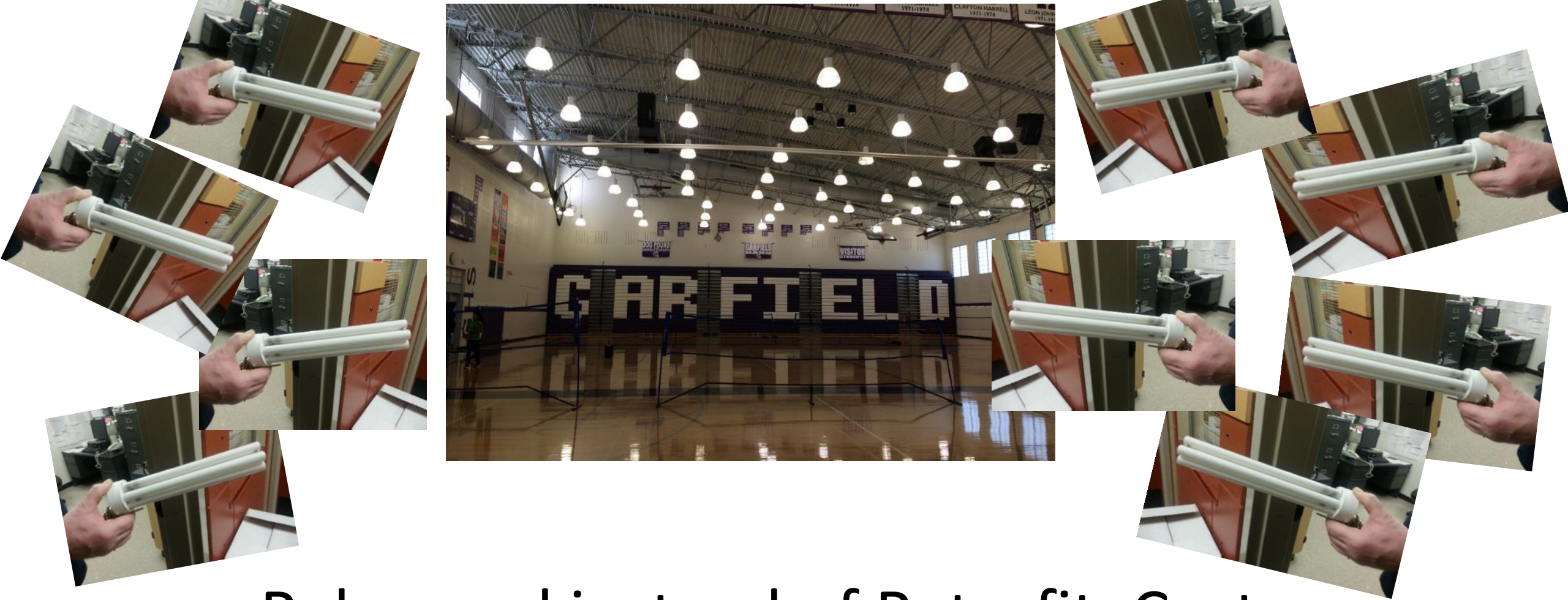
Gym counted 110  
“Sports Light”  
fixtures that last  
under one year, to  
be replaced by  
fewer LEDs

## Unexpected Influences: Consequences of Regulations around School spending

As in this optical illusion, there can be unexpected influences. Because of a complicated series of state legislative decisions and delays our budget was uncertain for most of the school year. Therefore we were unable to install the new LEDs as designed by LDL and incentivized by SCL







Relamped instead of Retrofit. Cost was 30% greater for 990 CFLs and 330 ballasts

# Case Study, New School Kitchens

- Visited new schools and both had hood lights left on
- Switches were hidden behind equipment in one school.
- Even when they are easy to find the user must know to turn them off as they leave.



# Things to Watch Out For



## New “FAD” Product

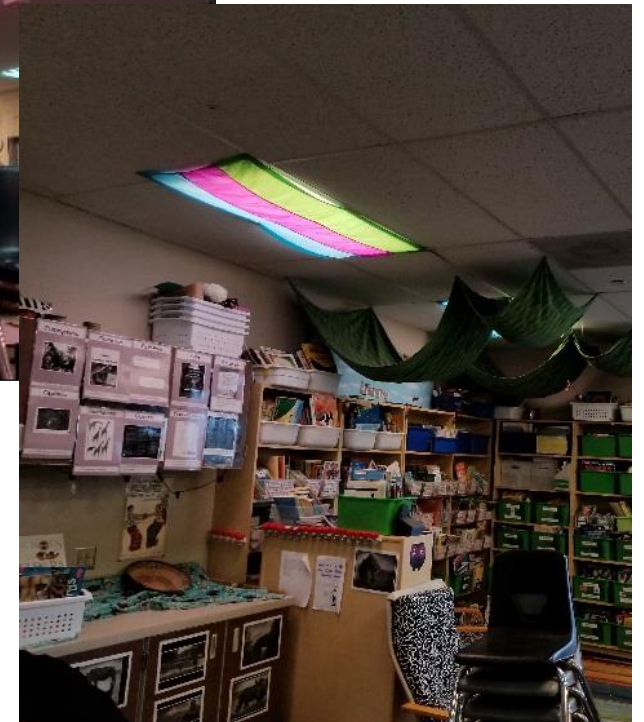
### Major Advertising Efforts in Teacher Magazines and at Conferences

Premium Fluorescent Light Covers | Block  
UV| Block Glare to Help Reduce  
Headaches, Eyestrain, Seasonal  
Depression | Supports Focus and Clarity |  
Work. Office. Home.

- Not tested
- Not endorsed by Doctors or Medical Associations
- Not allowed at our schools because:
  1. We cannot clean with the covers in place
  2. Custodians not responsible for the fabric
  3. Colors fall on desks
  4. Reduces light levels
  5. Creates poor light distribution



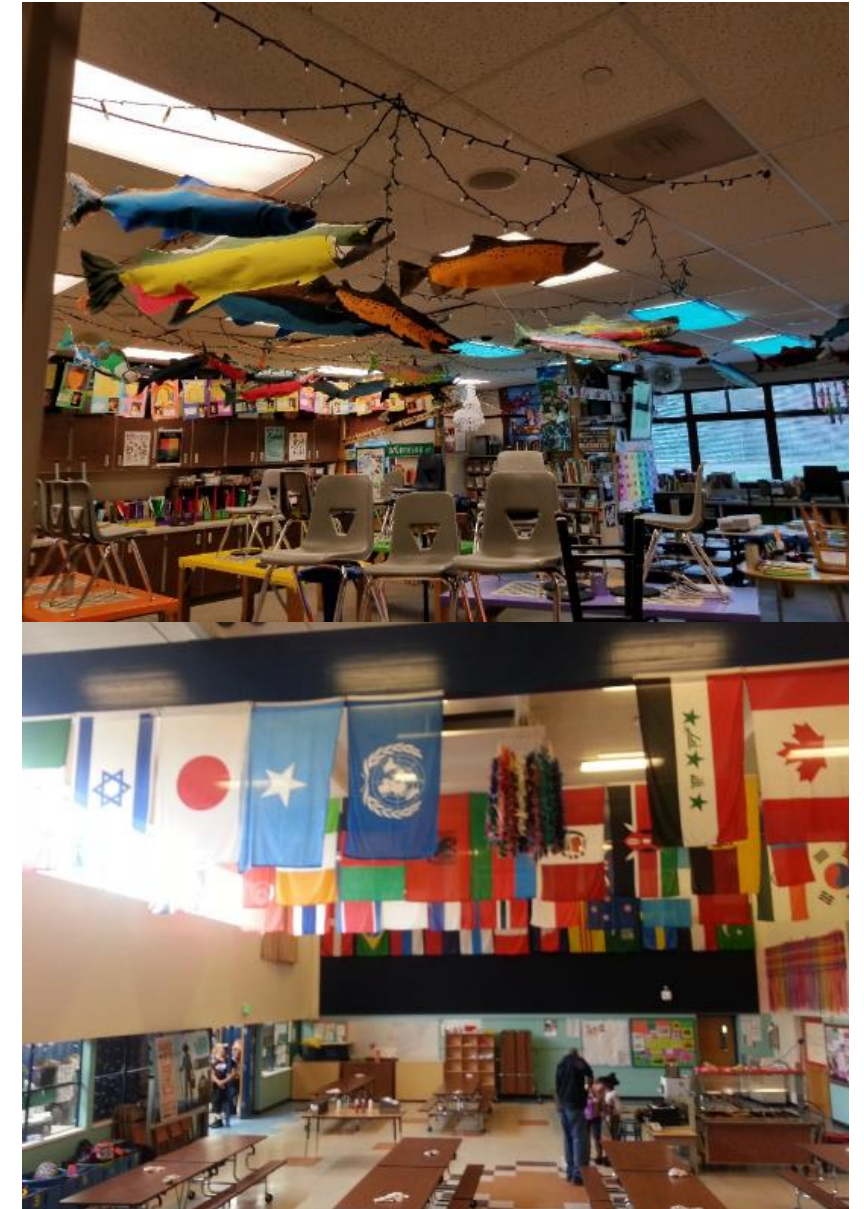
# This Product is: Light covers





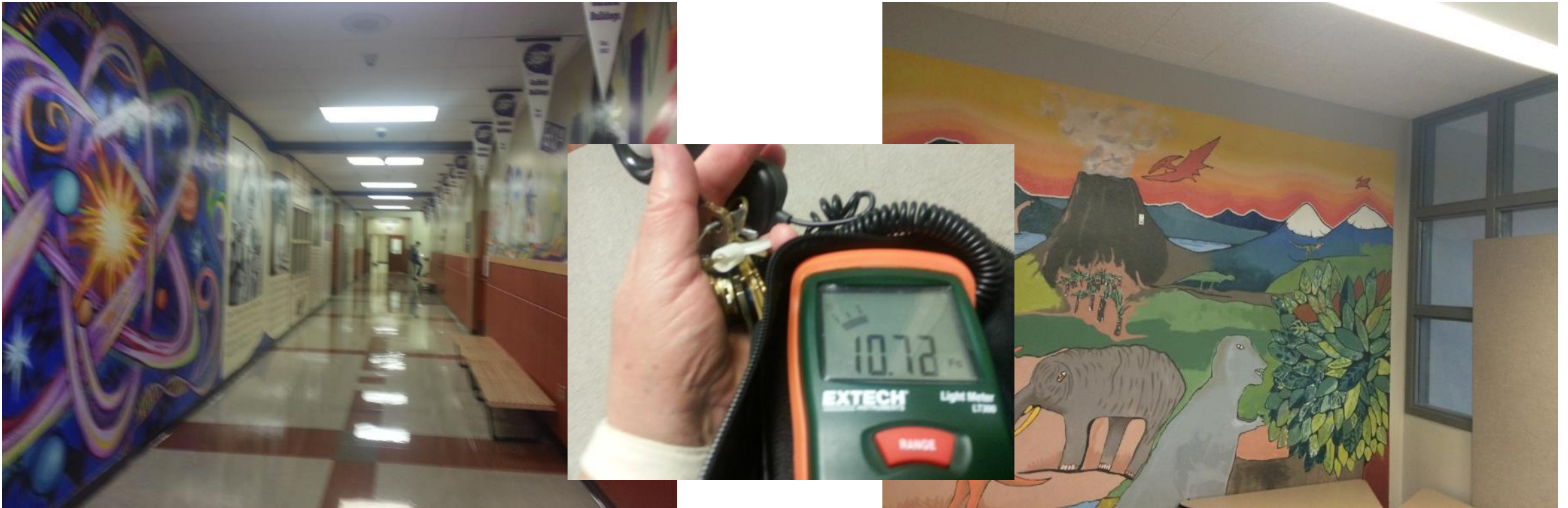
# Other Influences on Light Levels

## Wall and floor color and Wall hangings



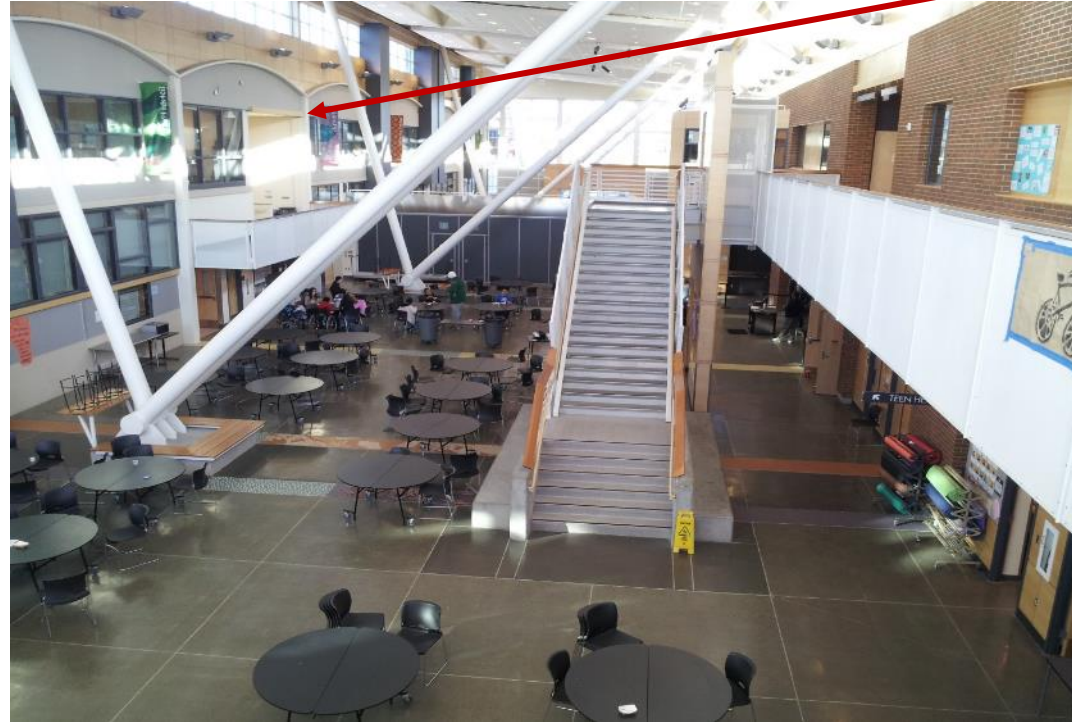
# Murals

Murals are educational and often beautiful, but impact light levels- from 30 to 5 or 10 foot candles





# Up Lights, a Removal Opportunity





Uplights don't work well upside down  
Here with T-5s in a cafeteria



# “Ornamental lights” – another removal opportunity





Ornamental Lights increase energy use and create unusual environmental conditions.


We are working to influence occupants to remove these ornamental lights in accordance with Superintendents Procedures 6810 and the local fire code.

We send frequent reminders to take the items home and educate leaders about lighting and conservation.

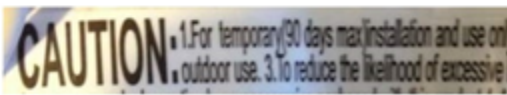




#### CHECK LIST BEFORE LEAVING TO AVOID WASTING RESOURCES

Take home personal items, including:  
appliances, ornamental lights, pets,  
plants and chargers



### Preparing for the New School Year



3. Make sure that you only bring items that are **safe for students**.

- Check for and follow the UL label
- Make sure all electrical items are rated for school use
- Use only CFL or LED light bulbs

# Closing Thoughts

- Lighting enhances the teaching and learning environment
- We can make choices that last dozens of years
- When we make mistakes we need to correct
- We have to pay attention to users and fads to be effective
- New products are arriving fast – we need partners to help us choose products that will perform





# Thank you from the Seattle Public Schools Team



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**Washington State University Energy Program**

***Go Cougs!***