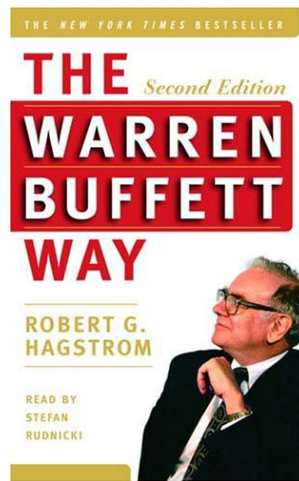


Case Study

A high-performance, performance contract for lighting

Budget Driven

- High performance should not be more expensive
 - What Would Warren do?
- After adjusting budget to reduce it by Fire & Life Safety; less ADA requirements, do you have enough room for high performance designs?
- How is your maintenance department going to support the investment?



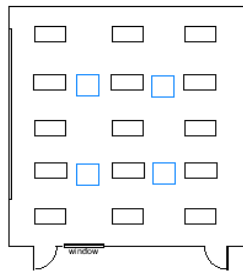
Project Objectives

- Use performance contract to fund state portion of known project (Prop 1a) for RH Dana ES and San Clemente HS
 - Leverage investment to allow for a TCO consideration versus least up-front cost method.
- Right-size classroom lighting:
 - Bring up to current standards
 - Improve energy efficiency
 - Provide task lighting on boards
 - Add day-lighting (test-score consideration)
 - Factor switching to take advantage of room layouts
- Choose systems that M&O can/will support

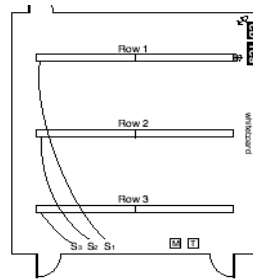
Lighting Scope of Project



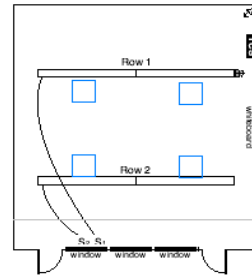
Details – Layout Design



SCHS Classroom



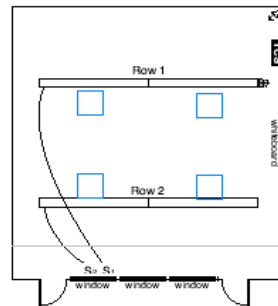
SCHS Shop/Music Classrooms



RC Dana ES

Details – System Controls

- Occupancy Sensor
- Opted not to use light level sensor (i.e. dimming)
- Provided for independent switching based on windows/room layout.
- Daylight with Shade



Details – Occupancy Sensors

- How do you quantify how real savings can be made?
- Occupant sensors shut off lights when no one is around . . . oh really, thank you.
- Test via your energy program.
- Control complaints lest they result in tampering.
- Keep a copy of the manufacturer's brief control instructions inside the cover.

Details of a Lighting Retrofit

- Lighting Retrofits
 - LBO – Light Ballast Only
 - Re-lamp only
 - Lens
 - Fixture
- Ballast
 - Electronic
 - Magnetic (old)
- Lighting types
 - Fluorescent "Troffers"
 - Pendant
 - Surface mount
 - Screw-Based Sockets
 - Exit and Emergency Lighting
- Ceiling Awareness
 - Acoustic
 - t-bar, glue, concealed spine
 - Seismic
 - t-bar strapping/guide wires
- Lighting Control
 - Occupant and Motion Sensors
 - Light sensors i.e. lamps have dimming capability
 - Timers and Time clock
 - Exterior photocells
 - Web enabled

M&O Purchasing Best Practices

- Lamps: centralize and standardize via your warehouse manager (fluorescent lamp recycling).
- Ballasts: You get what you pay for – buy brands that your electricians report don't fail – labor cost allot more than the materials. P.S. they are suppose to match the intended lamp.
- Controls: Replacements typically should be the same manufacturer and model number.

Lighting Maintenance

- Lens Replacement
- Re-lamping (predictive maintenance trending).
- Summer cleaning
- Deal with ballast failures on demand but monitor for predictive maintenance trends



“Bulbs grow in the ground” . . .

- **CFL – options**
- Save through reduce energy consumption
- On for hours at a time then will last longer than incandescent.



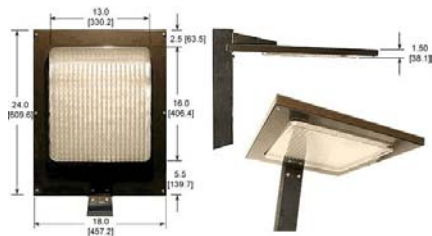
Exit and Emergency Lighting



- There should not be a single incandescent lamp exit sign in 2008
- Exit signs using fluorescent lamps are also cost effective to retrofit with LEDs
- LED and fluorescent are unfortunately not maintenance free.

Quick Lighting/Energy ROI's

- LED Technology
- Energy Management Software/Techniques
- Photocells
- Time clocks
- Day-lighting
- Energy Rebate Programs
- Calculate cost per square foot as metric



Calculating ROI

- Metric – cost per square foot, electrical work orders
- Validation method – utility company web site
- Factor – maintenance, any material failures

Public Interest Energy Research

Heritage Oak
Dudley ES

Control Classroom 1.75 watts/sq ft



PIER Classroom .8 watts/sq ft



Control Classroom 1.7 watts/sq ft



PIER Classroom .9 watts/sq ft



Revenue Sources/Programs

- Express Efficiency Program
- Savings by Design – Architects/lighting designer
- Performance Contracting ESCo's
- Technical Assistance firms

Web Resources

- Daylighting for Schools
 - www.pge.com/pec/daylight
- CHPS (The collaborative for high performance schools)
 - www.chps.net Phone; (877-642-CHPS)
- ANSI / IESNA (RP-3 Lighting for Educational Facilities)
 - www.iesna.org
- PIER & AEC (On-line PIER Information)
 - www.archenergy.com/lrp/default.htm
- Finelite
 - www.finelite.com