

Better Buildings By Design 2010



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Learning Objectives



Residential Lighting: Misconceptions & Misperceptions

- **At the end of this program, participants will be able to:**
 - Discuss what energy efficient lighting can deliver, separate myths from facts and be able to make informed decisions about residential lighting systems.
 - Evaluate facts on mercury issues and if they should be a concern.
 - Debate the validity of LED and CFL claims of long life and energy savings.
 - Explain the facts on low voltage incandescent bulbs.

DEFINING ENERGY EFFICIENCY

More than just wattage consumption...

LAMP LIFE

EFFICACY

MAINTENANCE

**LOWER WATTAGE THAN CURRENTLY
CONSUMED**

MANUFACTURING COSTS

LAMP DISPOSAL

The background of the slide is a grayscale image of architectural blueprints. Several blueprints are rolled up into cylinders, with their ends facing the viewer. The blueprints are spread out on a surface, showing various technical drawings, lines, and text. The overall scene is dimly lit, with a soft glow emanating from the center, highlighting the text.

Is a diet all about consuming fewer calories????

HUMAN CONSIDERATIONS

- How important is color?
- How important is the level of illumination (less or more than one currently has)?
- How does it make you feel?
- How important is it to dim the light source?
- How important is it to eliminate glare?
- How important is to provide energy efficient lighting solutions where people do not feel cheated?

DETERMINING FACTORS

Color Temperature

Initial Cost

Heat Production

Color Rendering

Operating Cost

Fixture Compatibility

Color Changing

Replacement Cost

UV Transmittance

Light Output (actual)

Ease of Maintenance

Code Compliance

Lumen Output

Availability

Energy Efficiency

Efficacy

Lamp Life

Accessorization

Distribution

Physical Size

Soft / Hard Edge

Dimmability

Physical Appearance

Effect on People

OVERALL COST COMPARSION

Lamp :	50PAR30/HIR/FL40
Watts:	50
Lumens:	900
Efficacy:	18 lm/watt
Life:	3000 hours
CCT:	2850K
CRI:	100%
Beam:	40 deg.
CBCP:	1400
Dimming:	Yes
Initial \$:	\$ 8.00
Operating:	\$ 7.28

Lamp :	FLE15/2/R30XL
Watts:	15
Lumens:	750
Efficacy:	50 lm/watt
Life:	10,000 hours
CCT:	2700K
CRI:	70%
Beam:	
CBCP:	
Dimming:	No
Initial \$:	\$ 7.00
Operating:	\$ 2.18

Lamp :	LED13/PAR30/830
Watts:	15
Lumens:	750
Efficacy:	50 lm/watt
Life:	25,000 hours
CCT:	2700K
CRI:	70%
Beam:	30 deg.
CBCP:	
Dimming:	No
Initial \$:	\$65.00
Operating:	\$ 2.18

HIR LAMP COMPARSION

Lamp :	50PAR30/HIR/FL40
Watts:	50
Lumens:	900
Efficacy:	18 lm/watt
Life:	3000 hours
CCT:	2850K
CRI:	100%
Beam:	40 deg.
CBCP:	1400
Dimming:	Yes
Initial \$:	\$ 8.00
Operating:	\$ 7.28

Lamp :	50PAR30/FL40
Watts:	50
Lumens:	660
Efficacy:	13 lm/watt
Life:	2500 hours
CCT:	2850K
CRI:	100%
Beam:	40 deg.
CBCP:	1300
Dimming:	Yes
Initial \$:	\$ 6.00
Operating:	\$ 7.28

INVERSE SQUARE LAW

$$\text{Footcandles} = \frac{\text{Center Beam Candlepower (CBCP)}}{\text{Distance Squared}}$$

Lamp : 50PAR30/HIR/FL40
Watts: 50
Lumens: 900
Efficacy: 18 lm/watt
CBCP: 1400
FC @ 6': 39

Lamp : 50PAR30/FL40
Watts: 50
Lumens: 660
Efficacy: 13 lm/watt
CBCP: 1300
FC @ 6': 36

Lamp : 50MR16/CFL40
Watts: 50
Lumens: 1250
Efficacy: 25 lm/watt
CBCP: 1700
FC @ 6': 47

Lamp : LED10/P30/S827
Watts: 10
Lumens: 320
Efficacy: 32 lm/watt
CBCP: 1300
FC @ 6': 36

LAMP LIFE

Incandescent: measured as the point at which 50% of a large sample group of lamps burn out.

Fluorescent: based on a 3 hour or 12 hour minimum burn. It is also sensitive to the ambient temperature.

LED: measured as the point at which the LED produces less than 50% of the initial lumen output. It is also very sensitive to ambient temperature. Most times, the driver will need to be replaced before the LED light source.

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IMPACT OF MERCURY

- **All fluorescent lamps contain small amounts of mercury in order to make them operate (average of 4 milligrams).**
- **Some manufacturers have dropped the mercury content to 1.5 – 2.5 milligrams per lamp.**
- **By comparison, old thermometers contained about 500 milligrams of mercury.**
- **If all 290 million CFLs sold in 2007 were sent to a landfill, they would add 0.16 percent to the US mercury emissions caused by humans.**
- **There are 104 metric tons of mercury emissions every year in the US from coal fired electric power.**
- **A 13 watt CFL saves approximately 4.0 milligrams of mercury emissions from entering the environment due to the decrease in energy consumption over the life of the lamp.**

LOW VOLTAGE LIGHT SOURCES

ADVANTAGES

- Smaller (tighter) filament results in greater light output
- Smaller physical size
- Typically longer lamp life when compared to line voltage equivalent
- Typically less direct heat in comparison to line voltage equivalent

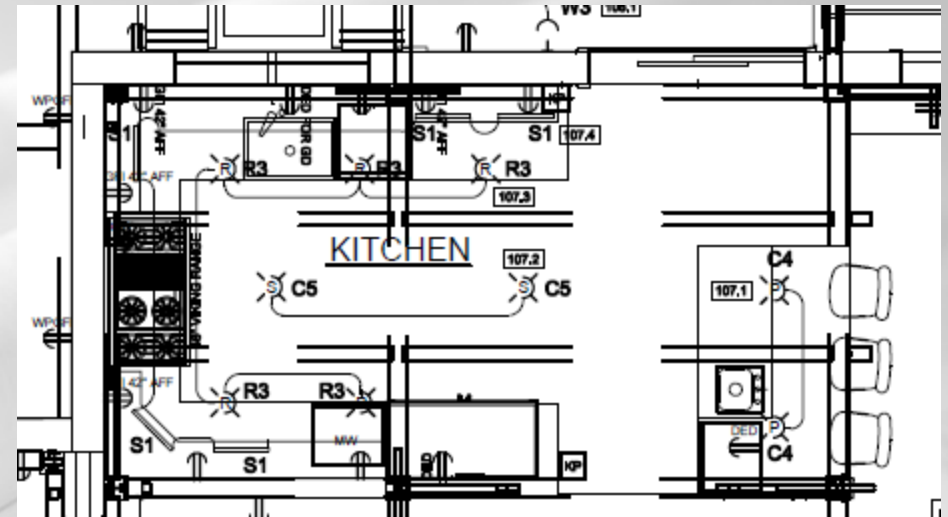
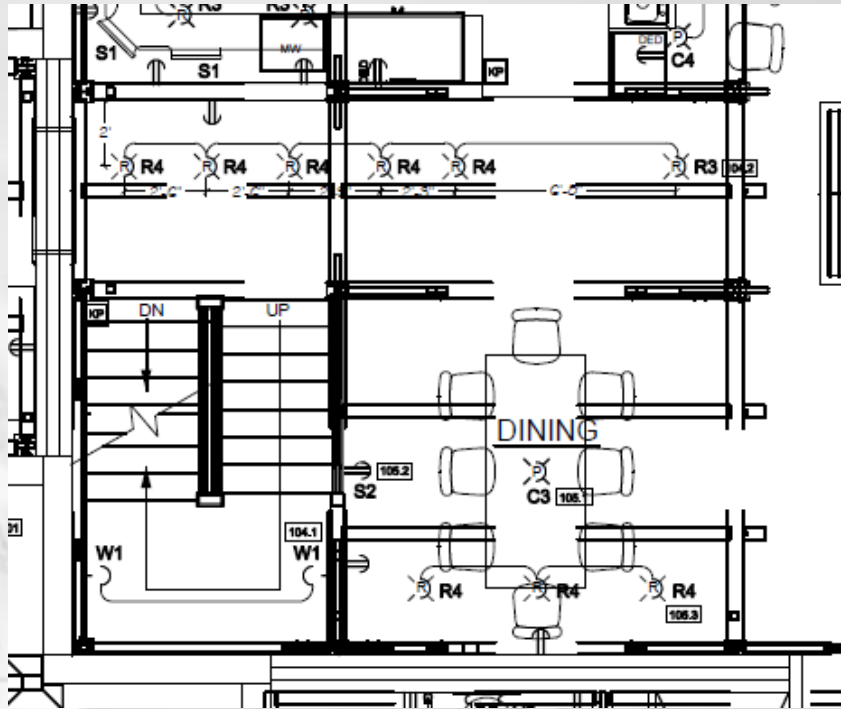
DISADVANTAGES

- Typically higher fixture cost due to need for transformer
- Dimming is possible, but more expensive device
- You have to deal with voltage drop
- Electronic transformers can cause harmonic distortion

Lamp :	50MR16/CFL40
Watts:	50
Lumens:	1250
Efficacy:	25 lm/watt
CBCP:	1700
FC @ 6':	47

Lamp :	50PAR30/HIR/FL40
Watts:	50
Lumens:	900
Efficacy:	18 lm/watt
CBCP:	1400
FC @ 6':	39

LEED CERTIFIED RESIDENTIAL LIGHTING



- All recessed fixtures are 26 watt 2700K CFL with integral dimming ballasts.
- All under cabinet lights are 2700K LED fixtures with integral drivers.
- All decorative fixtures can be standard incandescent throughout the house.

MAKING SMARTER CHOICES



Residential Product Performance Scale

Version 1

This Residential Product Performance Scale is a tool to help evaluate LED products to determine whether they are appropriate for a given application. The Scale compares performance values for the five characteristics identified on the Lighting Facts Label to performance values for those same characteristics in standard residential lighting technologies.

Light Output/Lumens
Measure light output. The higher the number, the more light is emitted.
Reported as "Total Reported Lumens" on LM79 test report.

Watts
Measures energy required to light the product. The lower the wattage, the less energy used.
Reported as "Power (Watts)" on LM79 test report.

Lumens per Watt/Efficacy
Measures efficiency. The higher the number, the more efficient the product.
Reported as "Efficacy" on LM79 test report.

Color Rendering Index (CRI)
Measures color accuracy. Determines how close the lamp's light spectrum is to the color appearance of objects.

Correlated Color Temperature (CCT)
Measures light color. CCT is a scale that indicates the color of light. CCT is measured in Kelvin (K). CCT is a scale that indicates the color of light. CCT is measured in Kelvin (K). CCT is a scale that indicates the color of light. CCT is measured in Kelvin (K).

IESNA LM-79-2008
A test method that measures the photometric quality of LED products. It is a standard for the lighting industry. It is a standard for the lighting industry. It is a standard for the lighting industry.

**Registration Number
Model Number
Type**

www.lightingfacts.com

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MAKING SMARTER CHOICES - RETROFITS

- CFLs were originally designed to replace standard A-lamps in portable fixtures.
- Heat rises...bad for ballasts
- Open or closed fixture types
- Fixture cutoff / glare control
- Voiding manufacturer warranty (lamp or fixture)...UL Testing???
- Know the impact of your retrofit choice.
- If the manufacturer does not list key information, don't buy it!

DON'T JUMP TO CONCLUSIONS

**250 watt LED
Spotlight
6 degree spread**



**150 watt CHM
Spotlight
6 degree spread**

EDISON BASED THEORY

If you design with technology specific fixtures, you run the risk of having that technology be obsolete within a year's time...

If you have no choice but to use technology specific fixtures, CFL technology is more stabilized.

If you design with fixtures that have a standard medium based socket, you will always have energy efficient selections to choose from that can change as the technology improves.