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2013

PRE-CONFERENCE
4.21.13 – 4.22.13

TRADE SHOW & CONFERENCE
4.23.13 – 4.25.13

Philadelphia, PA USA
Pennsylvania Convention Center

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Lighting Sommeliers: Pairing Integrated Solid-State Lamps and Dimmers in Existing Spaces

Tuesday, April 23, 2013
Session #L13S07

Eric Lind
VP – Global Specifications
Lutron Electronics Co. Inc.

Gregg Adams, LC, LEED® BD+C
Principal
Clanton & Associates, Inc.

Sommelier :: Lighting Designer

The Princeton Review

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- Day in the Life
- Quality of Life
- Present & Future
- Facts & Figures
- Majors

Back to Career Search

Career: Sommelier

Save

A Day in the life of a Sommelier

Sommelier is the French term for cellarmaster or wine steward. Sommeliers are individuals with a love of wine who are eager to impart some of their knowledge to the customer. They can describe the regions, grapes, vineyards and vintages of an assortment of wines. Many patrons are easily intimidated by wines and do not understand the terminology used to describe them. ***The sommelier must be ready to coax from patrons a description of their desires and be understanding of their budgetary limits.***

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What will we be covering?...

- The current white space
- Our performance expectations
- The “real” LEDi world today
- Touch on relevant electrical topics
- Dimming Behind the Scenes
- Future standards
- Go inside the numbers
- Design considerations and guidelines

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The current white space...

The benefits of advanced LED (Light Emitting Diode) technology include:

- Energy savings and long life
- Instant-on technology
- Quiet (no-hum) operation
- Will not fade fabrics or furnishings
- Mercury-free and RoHS compliant construction

WARNINGS AND CAUTIONS:

Suitable for use in open luminaires (fixtures).

This lamp is not suitable for totally enclosed fixtures or insulated air tight (ICAT) recessed down lights.

Suitable for DAMP locations.

Lifetime may be reduced if used in a recessed down light application.

This device is not intended for use with emergency exit fixtures or emergency lights.

This lamp is not compatible with photo controls, occupancy sensors, or timing devices.

Not for use with dimmers.

Before replacing, turn off power and let lamp cool to avoid electrical shock or burn.

NOTES:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. This Class B digital apparatus complies with Canadian ICES-003.

* At $0.11 kWh, this 10.5 watt, 800 lumen LED A19 uses $23.10 of electricity over its 20,000 hour life. This is a $108.90 savings when compared to the $132 required to run a 60 watt, 800 lumen incandescent A19 over the same period. Actual savings will vary depending on cost per kWh.

** 18.3 years means rated average life based on engineering testing and probability analysis where the lamp is used on average 3 hours/day, 7 days a week.

LIMITED WARRANTY:

[illegible] warrants that this bulb will be free from defects in material and workmanship and will operate for 6 years based on up to 3 hours average usage per day/7 days per week, when used as directed. If this bulb does not conform to the warranty, [illegible] will send you, at its election, a replacement bulb or refund your original purchase price upon receipt of the returned bulb, register receipt and proof of purchase. Please call our toll-free number, write to [illegible] or send an email at the website below to find out how to return the bulb. This limited warranty does not cover bulbs subject to accident, neglect, abuse, misuse or acts of God. REPLACEMENT OR REFUND IS YOUR SOLE REMEDY. EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ANY IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE DURATION OF THIS WARRANTY. LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IS HEREBY EXPRESSLY EXCLUDED. Some states do not allow exclusion of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

8227501
Model
929002204
Ordering Code:
BC10.5A19/VIS/3000 120V
Made in China

LISTED
LED Lamps
3PM5

Not for use...

- ...in totally enclosed fixtures
- ...in insulated or air-tight (ICAT) recessed downlights
- ...with dimmers
- ...photo controls, occupancy sensors or timing devices

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The current white space...

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION

Recalls

IMPORTANT SAFETY RECALL

LED Light Bulb Par20, G25 and A19

The bulb can overheat during use, posing a possible fire risk to persons and property

Par 20 at appx. $15

G25 at appx. $20

A19 at appx. $13

Recall date: March 19, 2013

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The current white space – LEDi Defined

"An integrated assembly comprised of LED packages (components) or LED arrays (modules), ***LED driver****, ANSI standard base and* ***other optical, thermal, mechanical and electrical components****...intended to connect directly to the branch circuit through a corresponding ANSI standard lamp-holder (socket)."*

Other components might include:

- Rectifier
- Power Factor Correction
- Filters
- Embedded intelligence?

Source: ANSI/IES RP-16-10 Nomenclature and Definitions for Illuminating Engineering

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The current white space

"In the case of self-ballasted LED systems intended for general service incandescent lamp replacement, the installed base of incandescent dimmers is the most likely control to be encountered."

- NEMA LSD49-2010

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The current white space

What is the significance of this?...

Approx 4 Billion

"In the case of self-ballasted LED systems intended for general service incandescent lamp replacement, the installed base of incandescent dimmers is the most likely control to be encountered."

- NEMA LSD49-2010

Approx 150 Million

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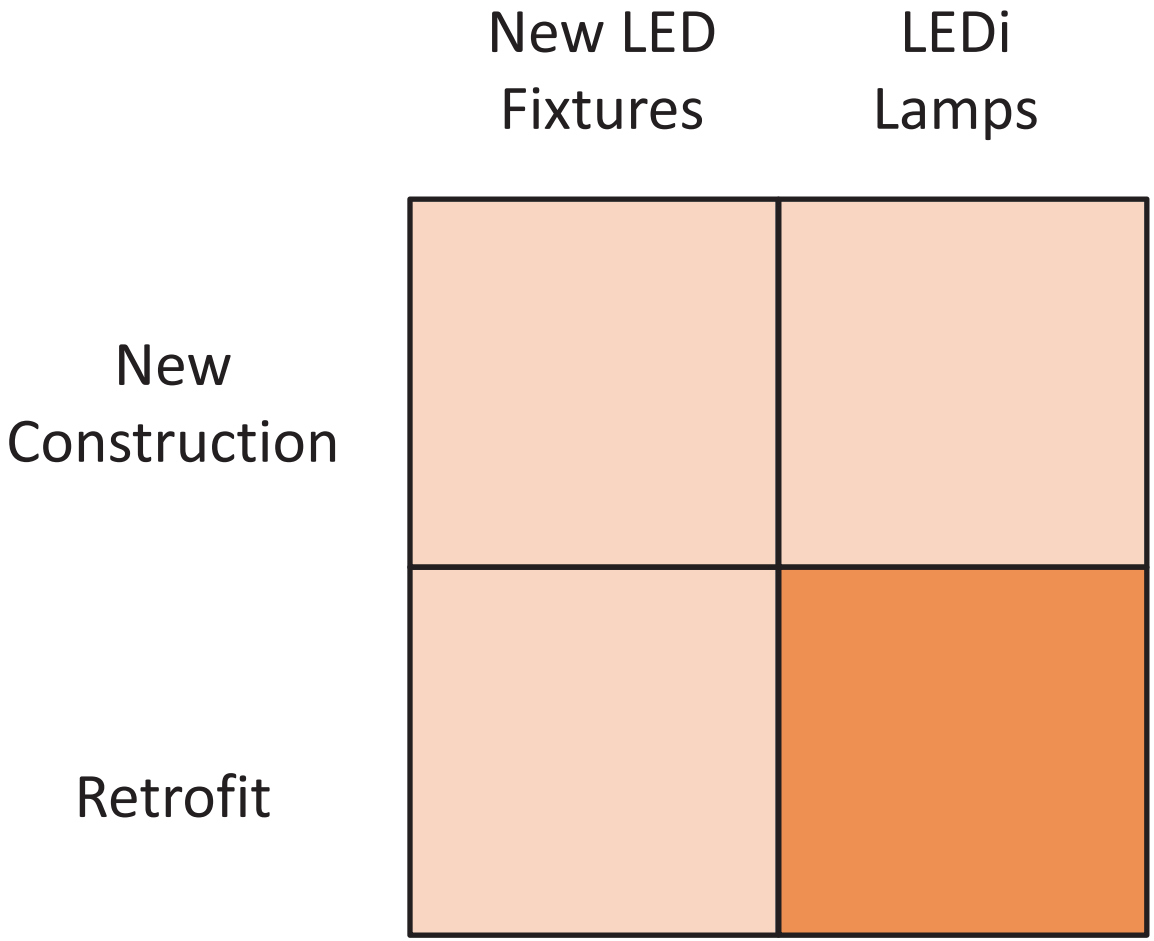
Where are we focused in this session?



Consumer expectation - Lamps

- Should be a “no brainer”
- Not proprietary
  - e.g. one 20W lamp can replace another 20W lamp from different mfg’s.
- Continuous dimming
- Smooth, not stepped
- Full range - Less than 1%
- Stability - No flicker or shimmer
- Quiet operation
- Color shift to warm as dimmed
- Price point $1.00 – 5.00

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Incandescent Dimming – The Gold Standard?...

- Smooth and continuous to < 0.1%
- Minimal negative power quality impacts
  - PF = 1.0 at 100% Output
- Not proprietary
  - e.g. the connected lamps don't determine device type
- No neutral wire connection
- No flicker or shimmer
  - esp. during travel
- No pop-on
- No drop-out
- No dead travel
- Price point = $3.00 – 40.00

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Compatibility: The current dilemma

"... a lamp's performance with one dimmer does not predict its performance with another."

- Lighting Research Center, *Technical Note: Dimming LED Integral Lamps (March 2011)*

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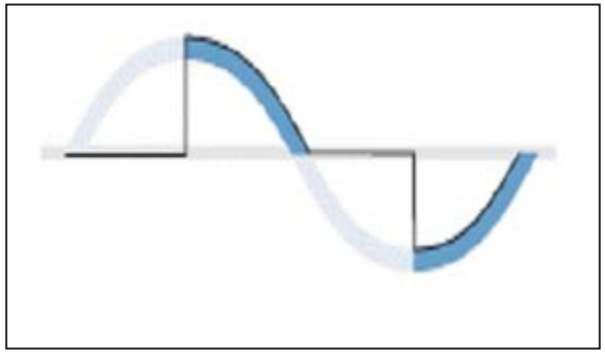
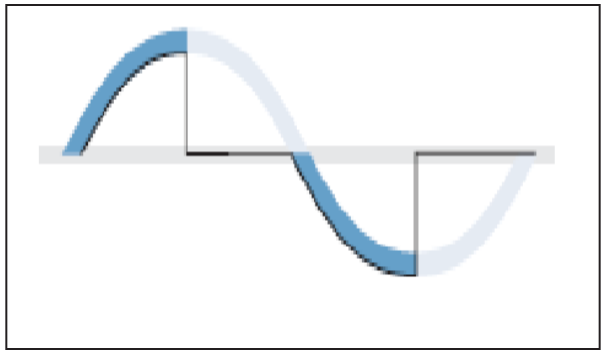
Additional Definitions...

Line Voltage Dimming



Forward Phase (Leading Edge)

- Most Common Dimming Method
- Originally developed for incandescent and not LEDs
- Use for magnetic low voltage transformers (“MLV”)



Reverse Phase (Trailing Edge)

- Typically used for electronic low voltage transformers (“ELV”)
- Smaller install base, usually requires a neutral wire

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Additional Definitions...

Flicker: An unexpected intense modulation of light level

Flash: An extended on/off cycling of the light

Shimmer: The unexpected low intensity, high frequency modulation of light (ex: candle, Christmas tree lights, etc)

Pop-on: The light turns on at a higher level than the preset level

Drop-out: Light should turn off when the switch is turned off

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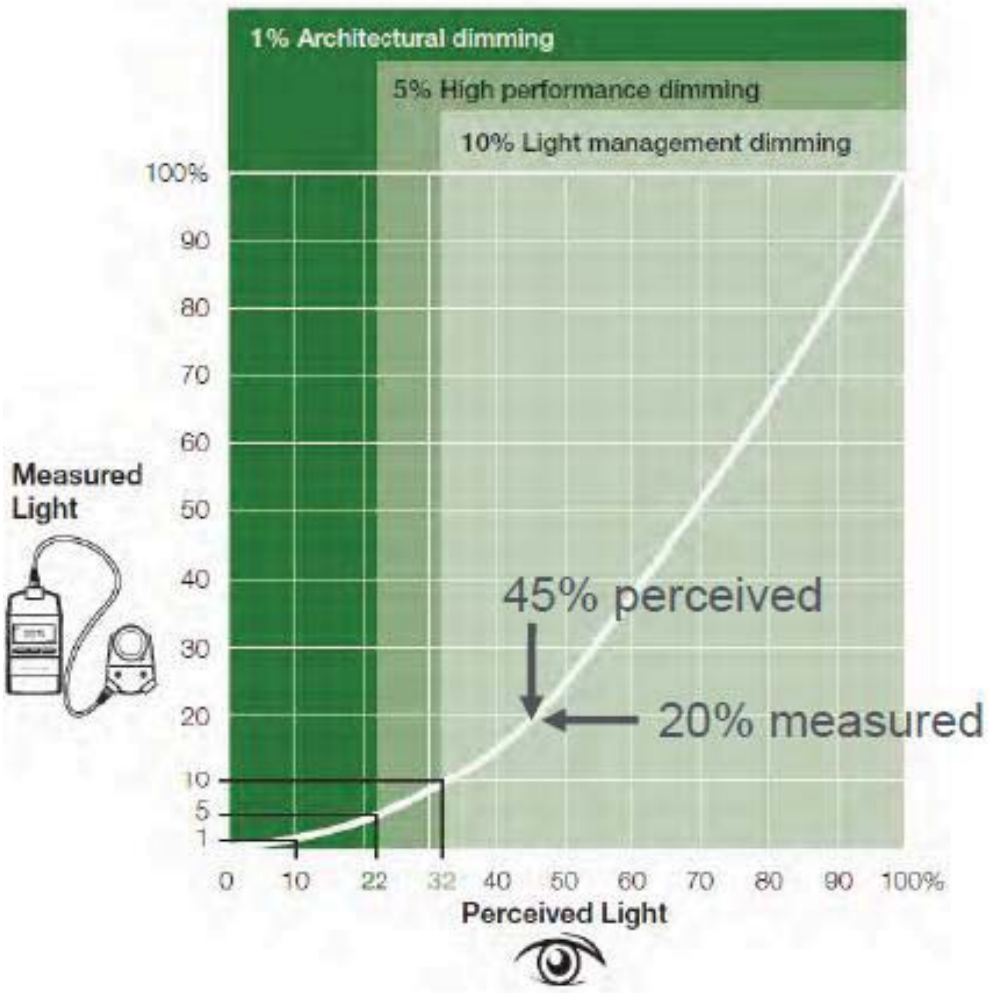
Additional Definitions...



Measured Light	Perceived Light
50%	70.7%
20%	44.7%
10%	31.6%
5%	22.4%
1%	10.0%

Additional Definitions...

Audible Noise: From driver or control

Popcorning: Mismatched start times

Delayed Start-Up: > 2 seconds from button press until illumination

Dead Travel: Adjusting the control with no change in light level

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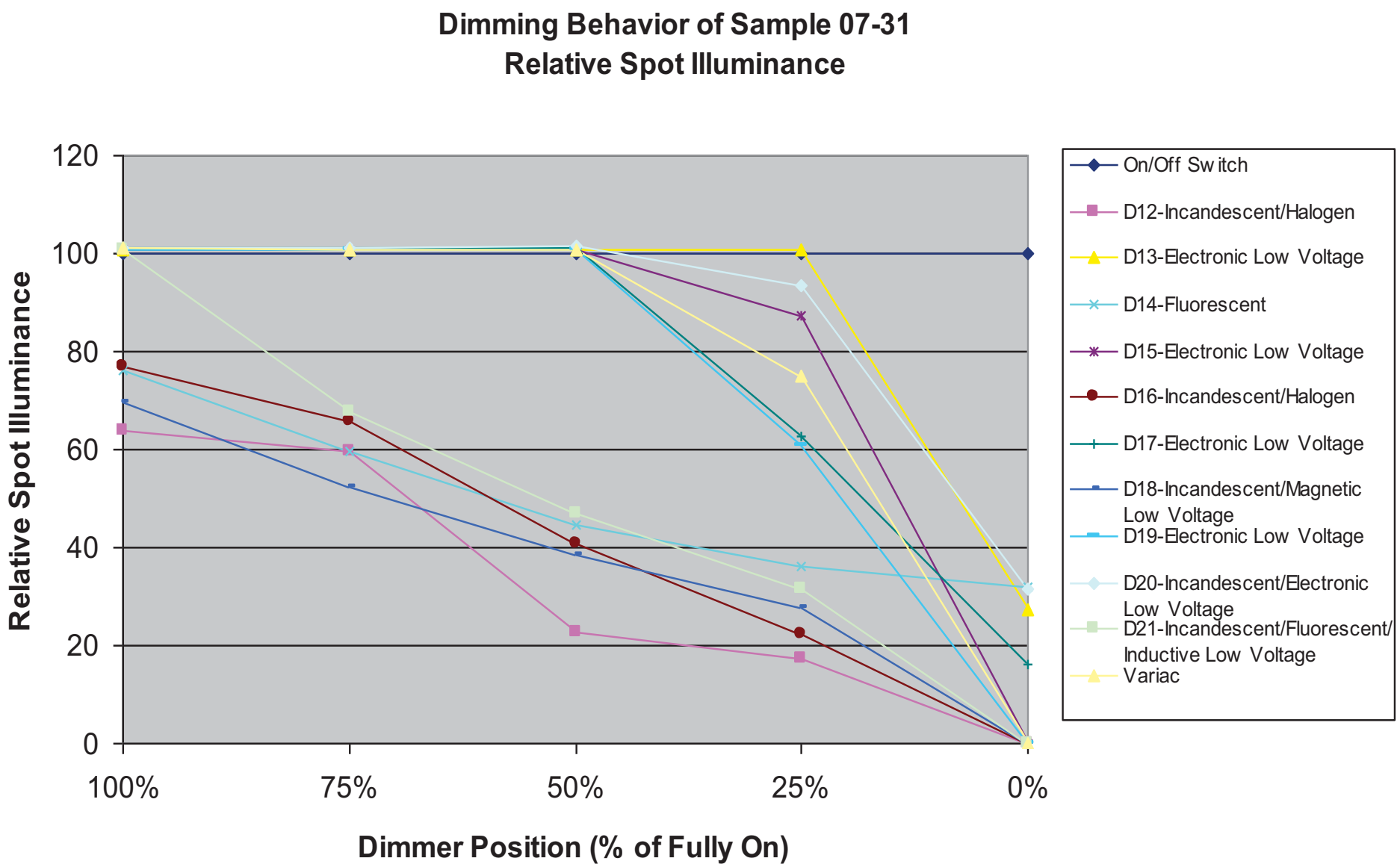
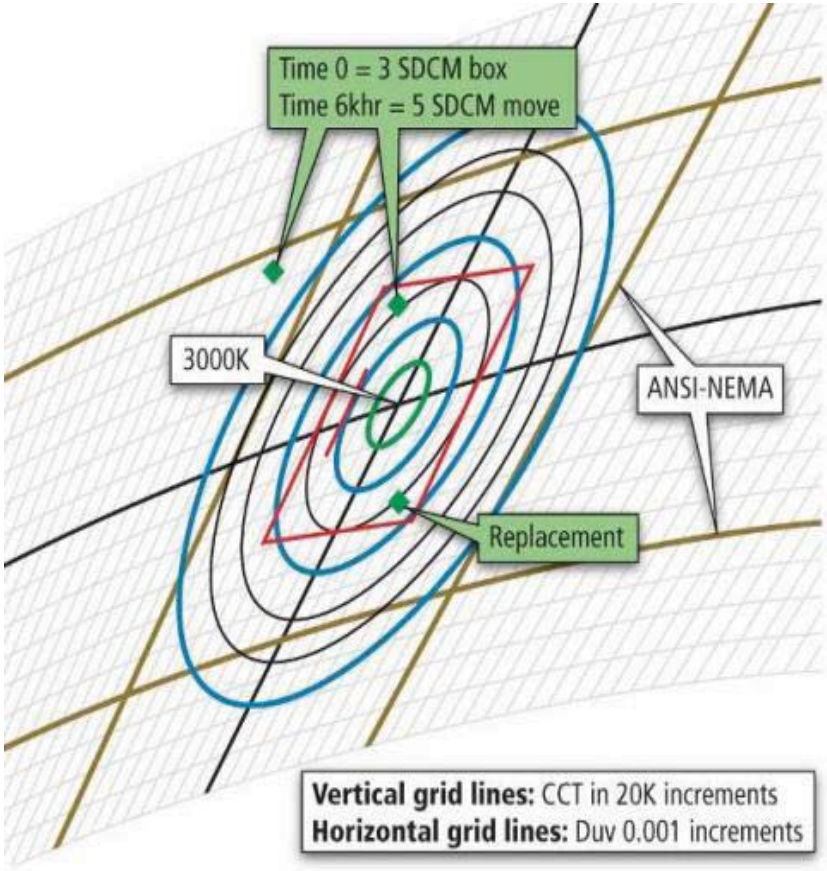
Additional Definitions...



Additional Definitions

Color Quality



Source: http://ledsmagazine.com/features/9/3/5/SILmauryfig4

Color Rendering Index†: measure of the degree of color shift objects undergo when illuminated by the light source compared to a reference source.

Correlated Color Temperature†**:** the absolute color temperature of a blackbody whose chromaticity most nearly resembles that of the light source.

Chromatic Color†**:** Perceived color possessing a hue (e.g. blue, red, green)

Color Shift: perceptible change in hue, saturation or brightness of a light source over time or voltage range.

†ANSI/IES *Nomenclature and Definitions for Illuminating Engineering (RP-16-10)*

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Do you want color shift?

Temp. °K	Normal brightness new candles per cm²	Spectral emissivity 0.65μ	Spectral emissivity 0.467μ	Color emissivity	Total emissivity	Brightness temp. 0.65μ	Color temp.
1000	0.0091	.458	.486	.395	.114	966	1007
1100	0.001	.456	.484	.392	.128	1059	1108
1200	0.006	.454	.482	.390	.143	1151	1210
1300	0.029	.452	.480	.387	.158	1242	1312
1400	0.11	.450	.478	.385	.175	1332	1414
1500	0.33	.448	.476	.382	.192	1422	1516
1600	0.92	.446	.475	.380	.207	1511	1619
1700	2.3	.444	.473	.377	.222	1599	1722
1800	5.1	.442	.472	.374	.236	1687	1825
1900	10.4	.440	.470	.371	.249	1774	1928
2000	20.0	.438	.469	.368	.260	1861	2032
2100	36	.436	.467	.365	.270	1946	2136
2200	61	.434	.466	.362	.279	2031	2241
2300	101	.432	.464	.359	.288	2115	2345
2400	157	.430	.463	.356	.296	2198	2451
2500	240	.428	.462	.353	.303	2280	2556
2600	350	.426	.460	.349	.311	2362	2662
2700	500	.424	.459	.346	.318	2443	2769
2800	690	.422	.458	.343	.323	2523	2876
2900	950	.420	.456	.340	.329	2602	2984
3000	1260	.418	.455	.336	.334	2681	3092
3100	1650	.416	.454	.333	.337	2759	3200
3200	2100	.414	.452	.330	.341	2837	3310
3300	2700	.412	.451	.326	.344	2913	3420
3400	3400	.410	.450	.323	.348	2989	3530
3500	4200	.408	.449	.320	.351	3063	3642
3600	5200	.406	.447	.317	.354	3137	3754

Source: Properties of Tungsten, *CRC handbook of Chemistry and Physics*, CRC Press, 59th Edition (1979)

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1400	0.11	.450	.47				
1500	0.33	.448	.47				
1600	0.92	.446	.47				
1700	2.3	.444	.47				
1800	5.1	.442	.47				
1900	10.4	.440	.47				
2000	20.0	.438	.46				
2100	36	.436	.467	.365	.270	1946	2135
2200	61	.434	.466	.362	.279	2031	2241
2300	101	.432	.464	.359	.288	2115	2345
2400	157	.430	.463	.356	.296	2198	2451
2500	240	.428	.4				
2600	350	.426	.4				
2700	500	.424	.4				
2800	690	.422	.4				
2900	950	.420	.4				
3000	1260	.418	.4				
3100	1650	.416	.4				
3200	2100	.414	.4				
3300	2700	.412	.451	.326	.344	2913	3420
3400	3400	.410	.450	.323	.348	2989	3530
3500	4200	.408	.449	.320	.351	3063	3642
3600	5200	.406	.447	.317	.354	3137	3754

1600 Kelvin @ 0.2%

2700 Kelvin @ full

Source: Properties of Tungsten, *CRC handbook of Chemistry and Physics*, CRC Press, 59th Edition (1979)

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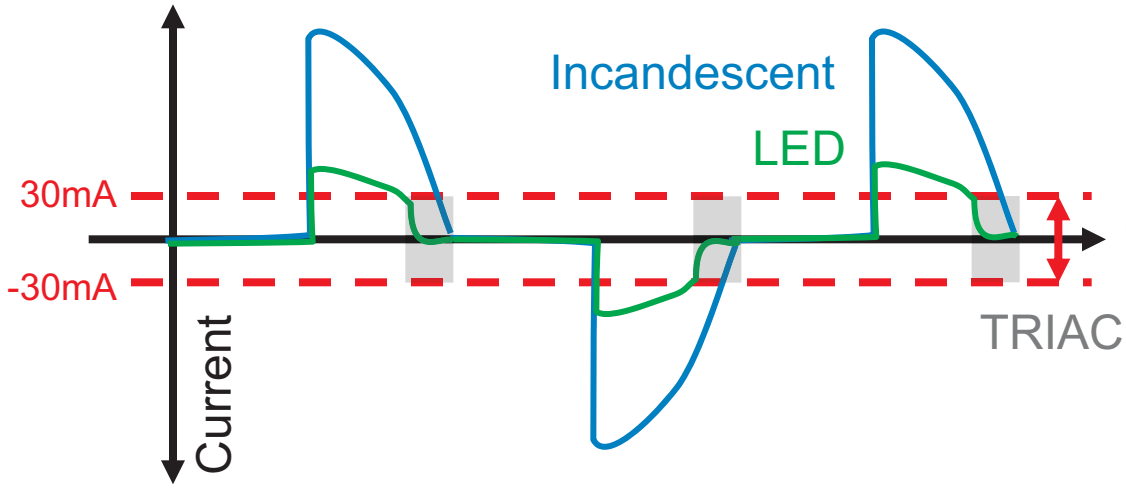
Minimum Load



Symbol	Test Conditions	Quadrant		BTA10 / BTB10		Unit
				C	B	
I_{GT} (1)	V_D = 12 V R_L = 33 Ω	I - II - III IV	MAX.	25 50	50 100	mA
V_{GT}		ALL	MAX.	1.3		V
V_{GD}	$V_D = V_{DRM}$ R_L = 3.3 kΩ T_j = 125°C	ALL	MIN.	0.2		V
I_H (2)	I_T = 500 mA		MAX.	25	50	mA

The *real* LEDi world today...

St. Cecilia's – Boston, MA

Video courtesy of Lana Nathe. Used with permission.

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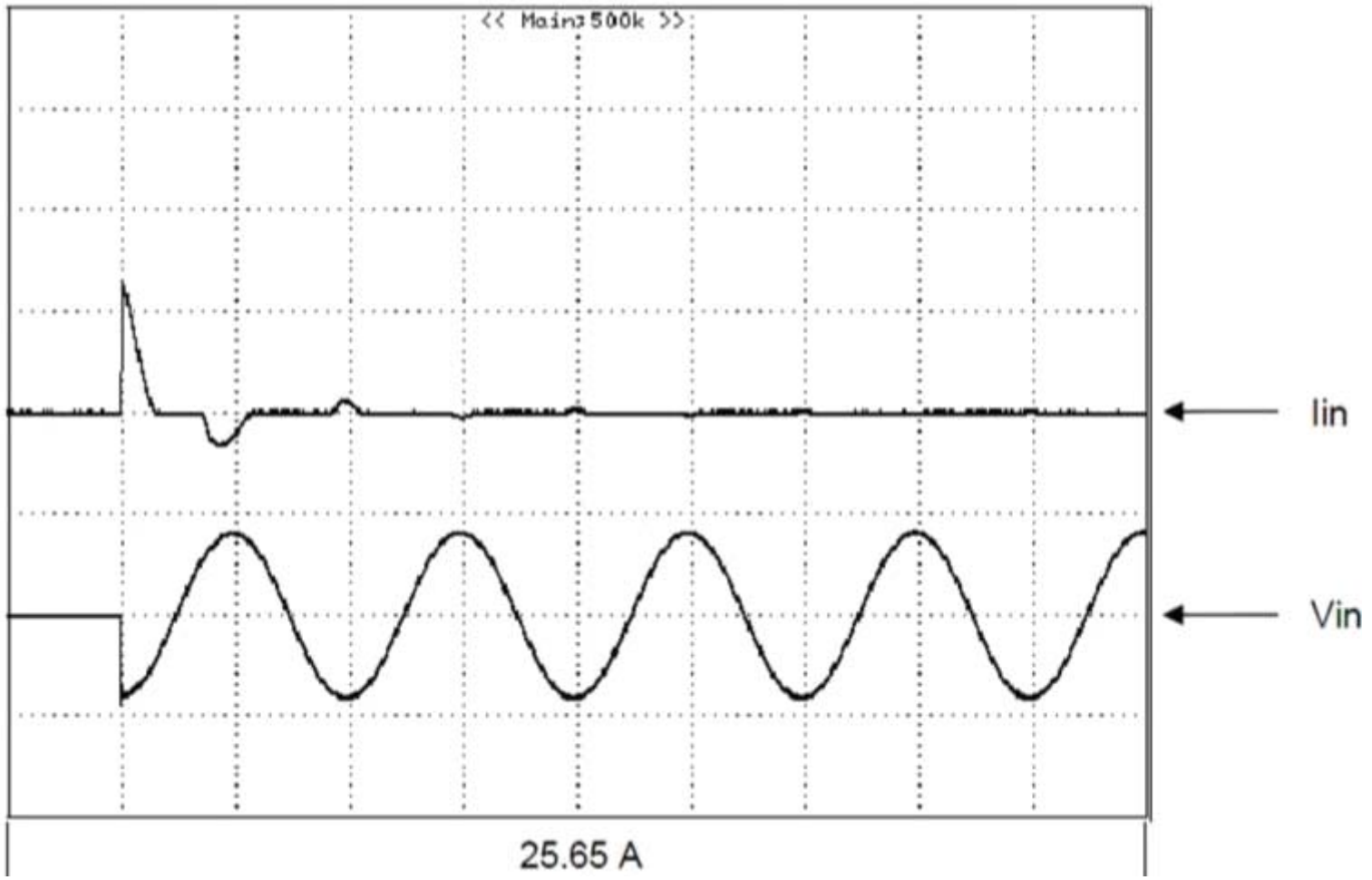
Performance Considerations

Inrush Current

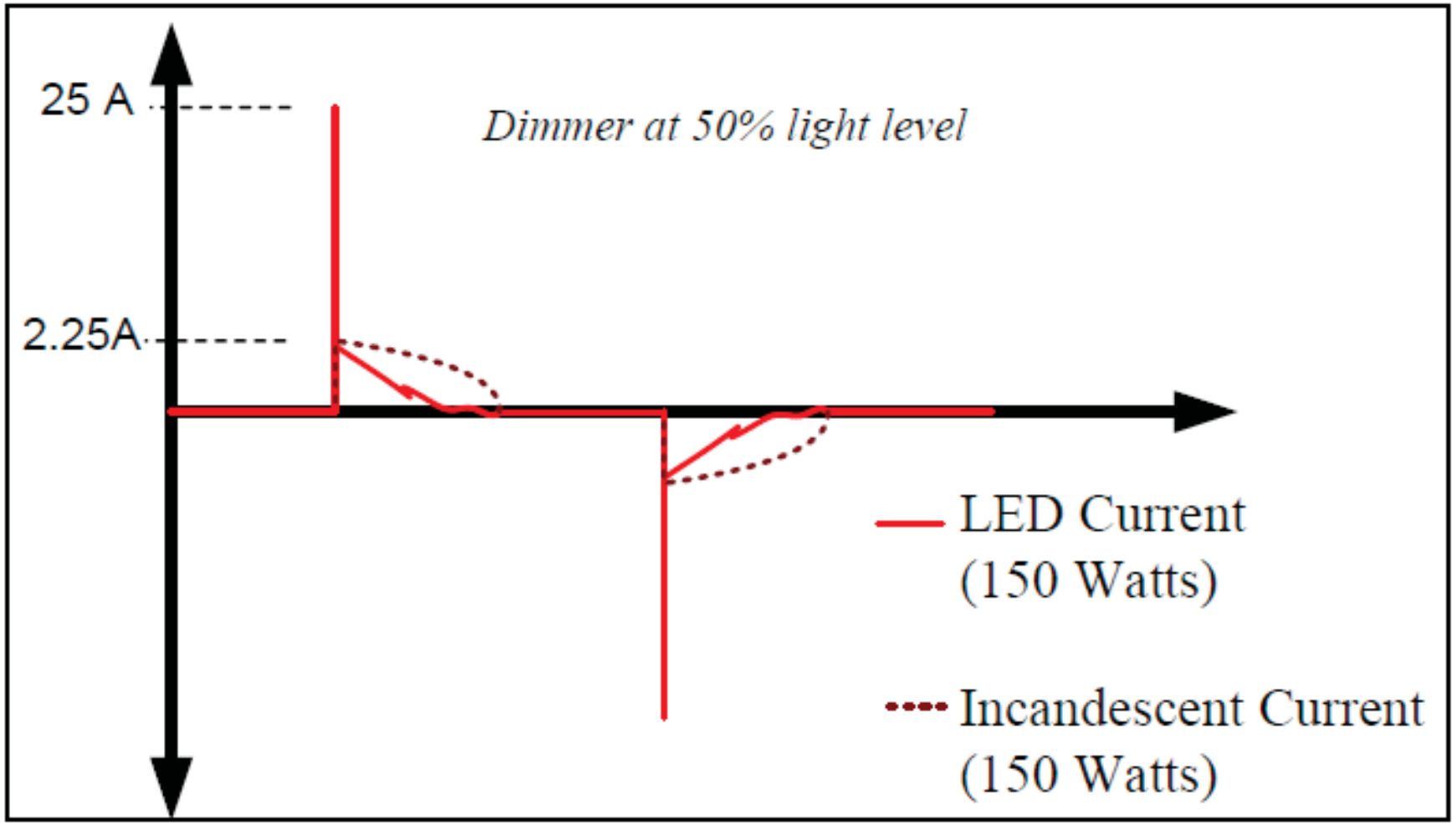
(incandescent lamp at turn on)



Source: http://power-topics.blogspot.com/2011/02/inrush-currents-external-fusing-on.html

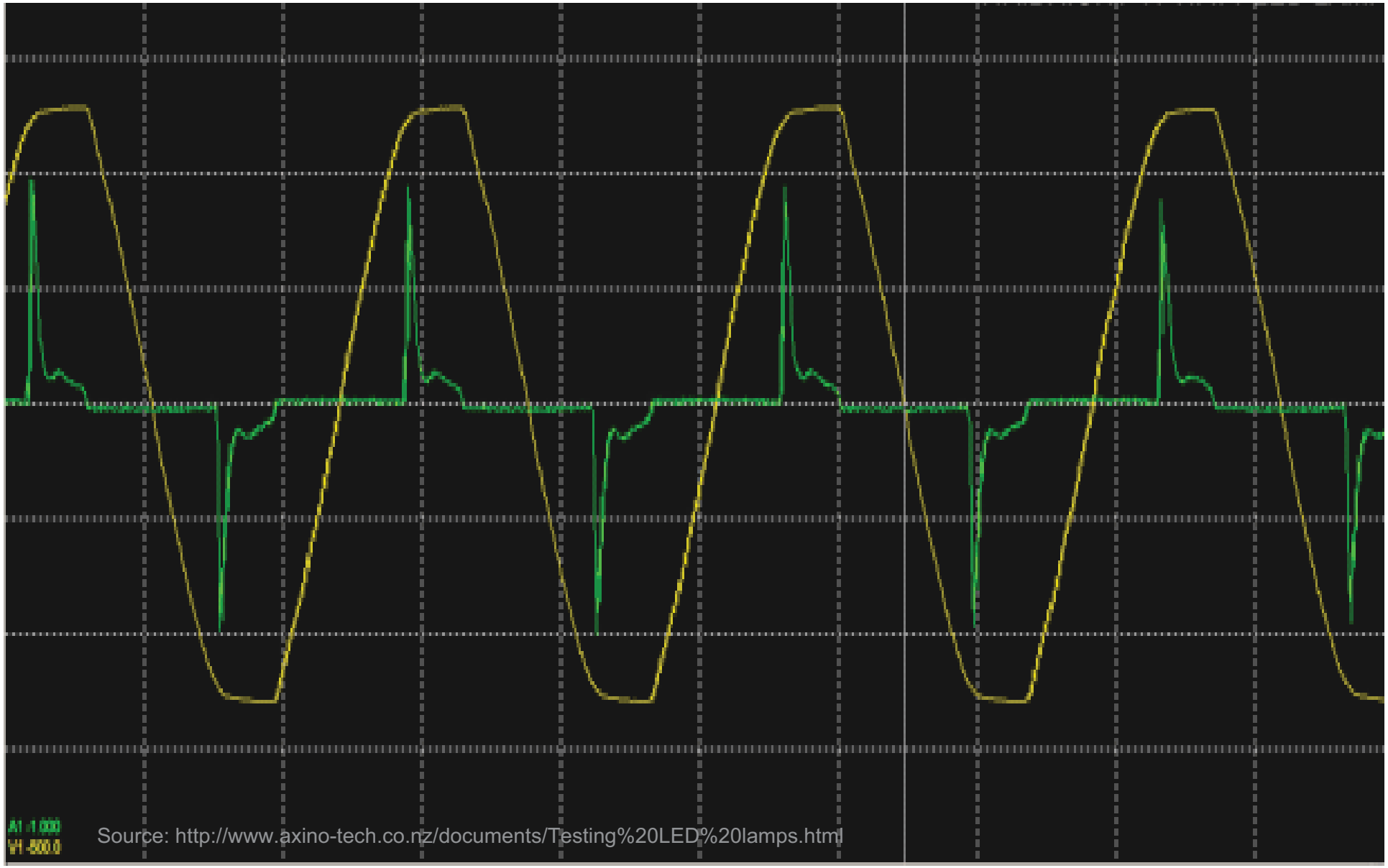
Performance Considerations

Repetitive Peak Current



Performance Considerations

Repetitive Peak Current



Source: http://www.axino-tech.co.nz/documents/Testing%20LED%20lamps.html

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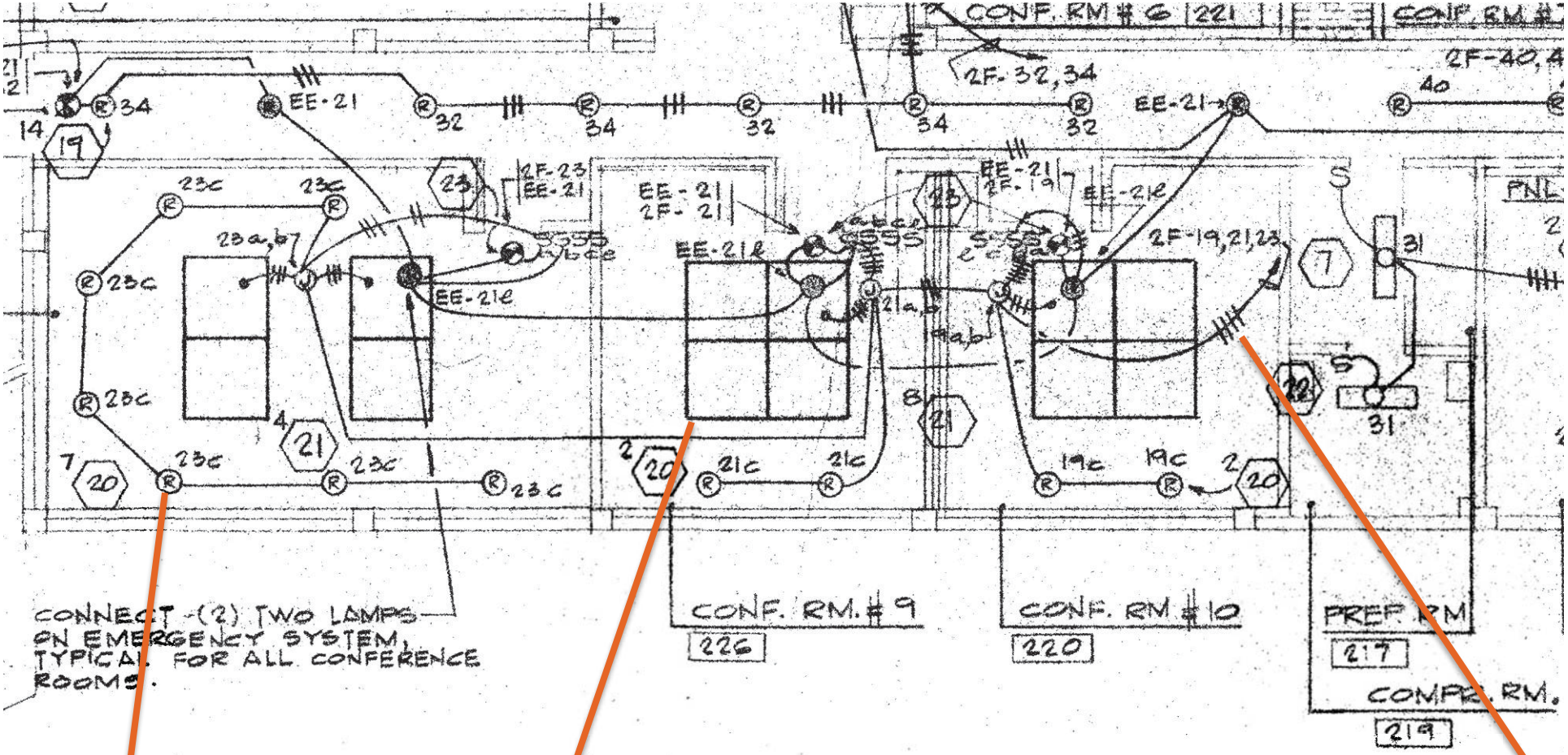
Existing Hospitality Facility



6” rec. inc. downlight with LEDi replacement

2x4 4-lamp T8 lensed (4x4 shown)

3Ø, 4W 277/480V
3 ckts sharing a neutral

No neutral wire at switch locations...

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The *real* LEDi world today...

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Relevant Electrical Topics

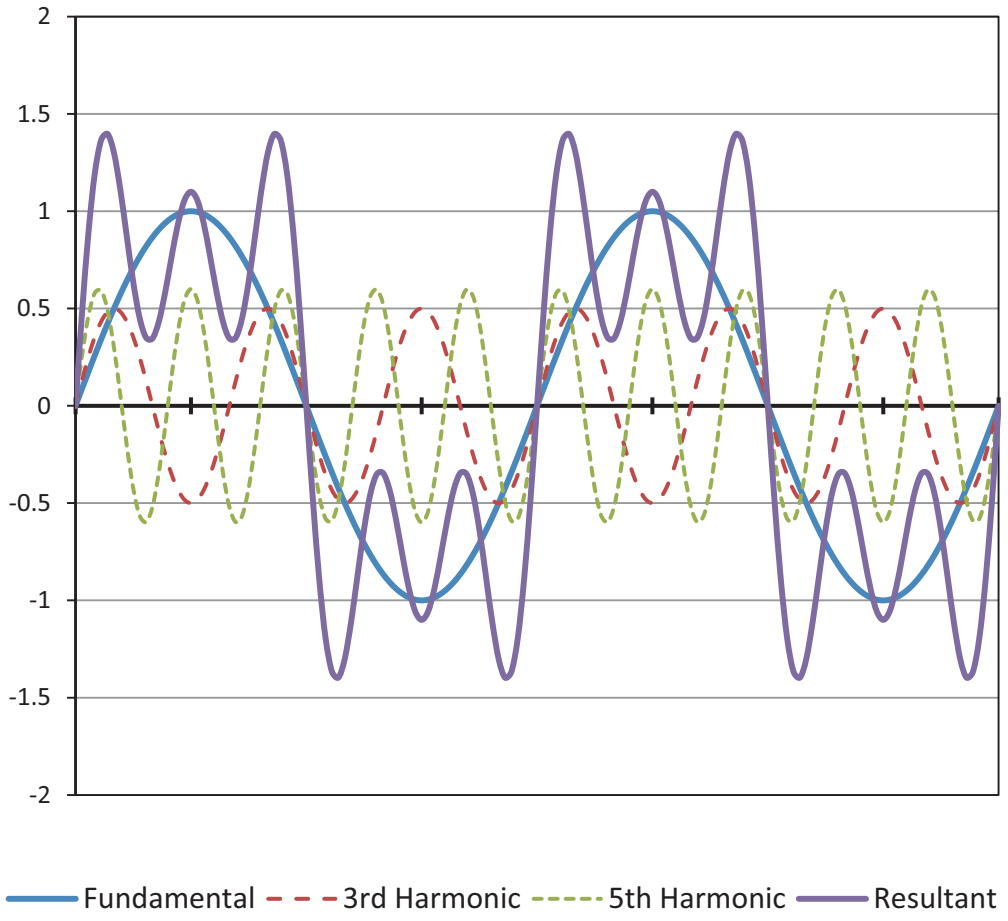
Total Harmonic Distortion (THD)

Electrical **NOISE** in A/C systems
- Current (and sometimes Voltage)

Reduces **QUALITY** of power in system
- Potential for **degradation** of conductors and insulating materials
- Causes **overheating** of induction motors, transformers and capacitors
- **Overloading** of current on neutrals

NEMA Limits on THD for LED replacement lamps:

Input Power	Maximum THD_I
P <= 30W	200%
35W < P <= 60W	80%
60W < P <= 100W	50%
P > 100W	20%



Source: ANSI/NEMA Harmonic Emission Limits – Related Power Quality Requirements for Lighting Equipment

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Relevant Electrical Topics

Total Harmonic Distortion (THD)

	Watts	Lumens	Total Harmonic Distortion (THD)		Total Harmonic Current (THC)	
			Not Dimmed	Dimmed 50% (90°)	Not Dimmed	Dimmed 50% (90°)
Incandescent	1000	15000	1%	68%	0.05A	3.76A
CFLi (Sylvania CF24EL/TWIST/DIM)	240	15000	105%	232%	1.98A	4.59A
LEDi (Philips 8E26A60 EnduraLED)	267	15000	72%	144%	1.76A	1.23A

Source: Lutron Electronics, Inc.

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Relevant Electrical Topics

Power Factor

Devices are rated in **REAL POWER (W)**

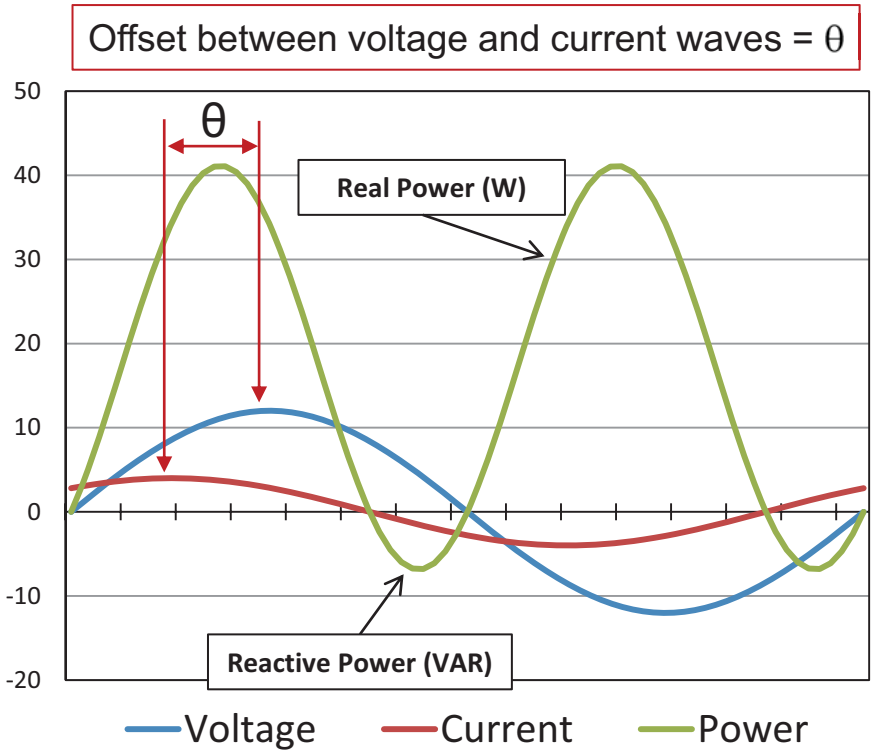
- Your cost

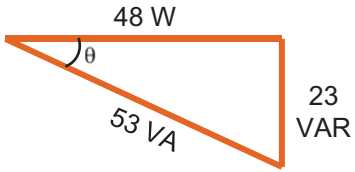
Electric utilities generate **TOTAL POWER (VA)**

- Their cost

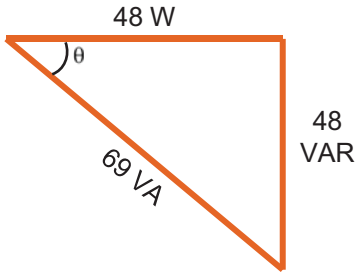
POWER FACTOR is the ratio of **REAL POWER** to the **TOTAL POWER** (PF = W/VA).

- PF describes how efficiently a device uses Total Power





$$PF = \frac{48\ W}{53\ VA} = 0.9$$



$$PF = \frac{48\ W}{69\ VA} = 0.7$$

Low PF devices represent ***lost revenue*** for utility companies because they waste generated VA.

Relevant Electrical Topics

Flicker

- Present in all light sources that operate on 120VAC circuits
- Phosphors have little or no persistence... for now.
- Energy Star's LED Light Bulb Criteria only has a requirement for operating frequency ≥ 120 Hz
- High frequency ballasts for fluorescent lamps that comply with ANSI C82.11 standard have an operating frequency of over 20,000 Hz

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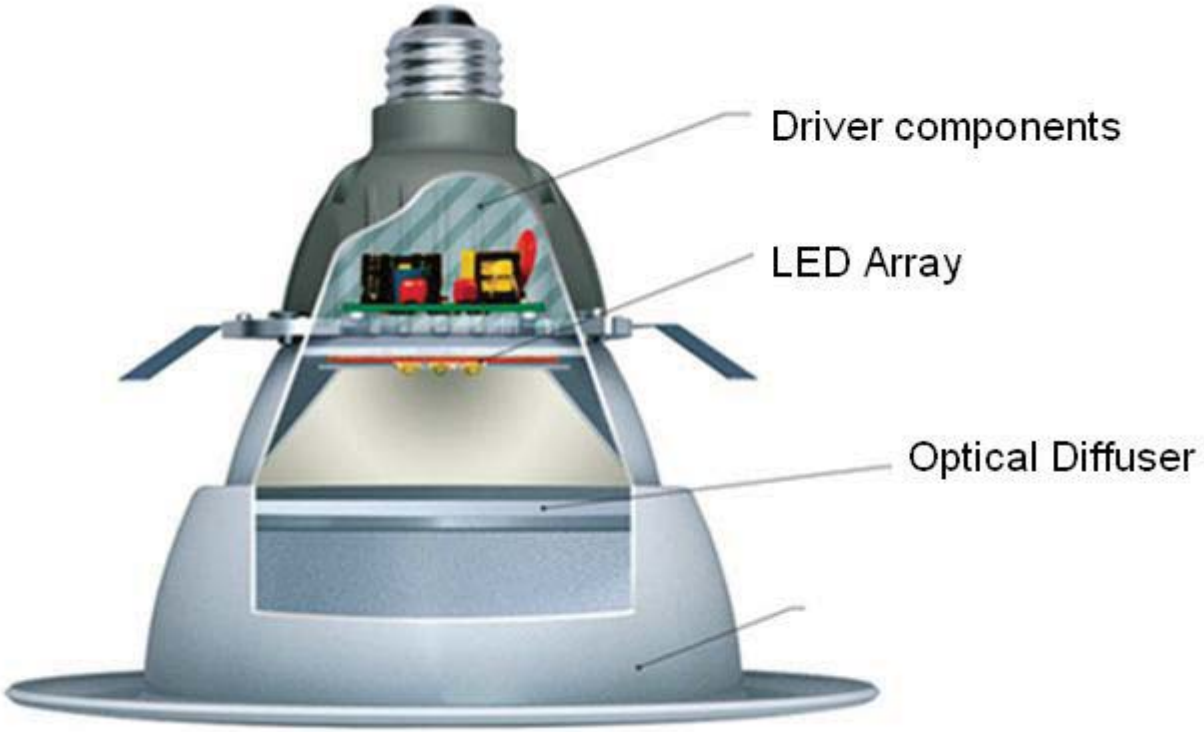
Dimming behind the scenes

Integrated LED Replacement



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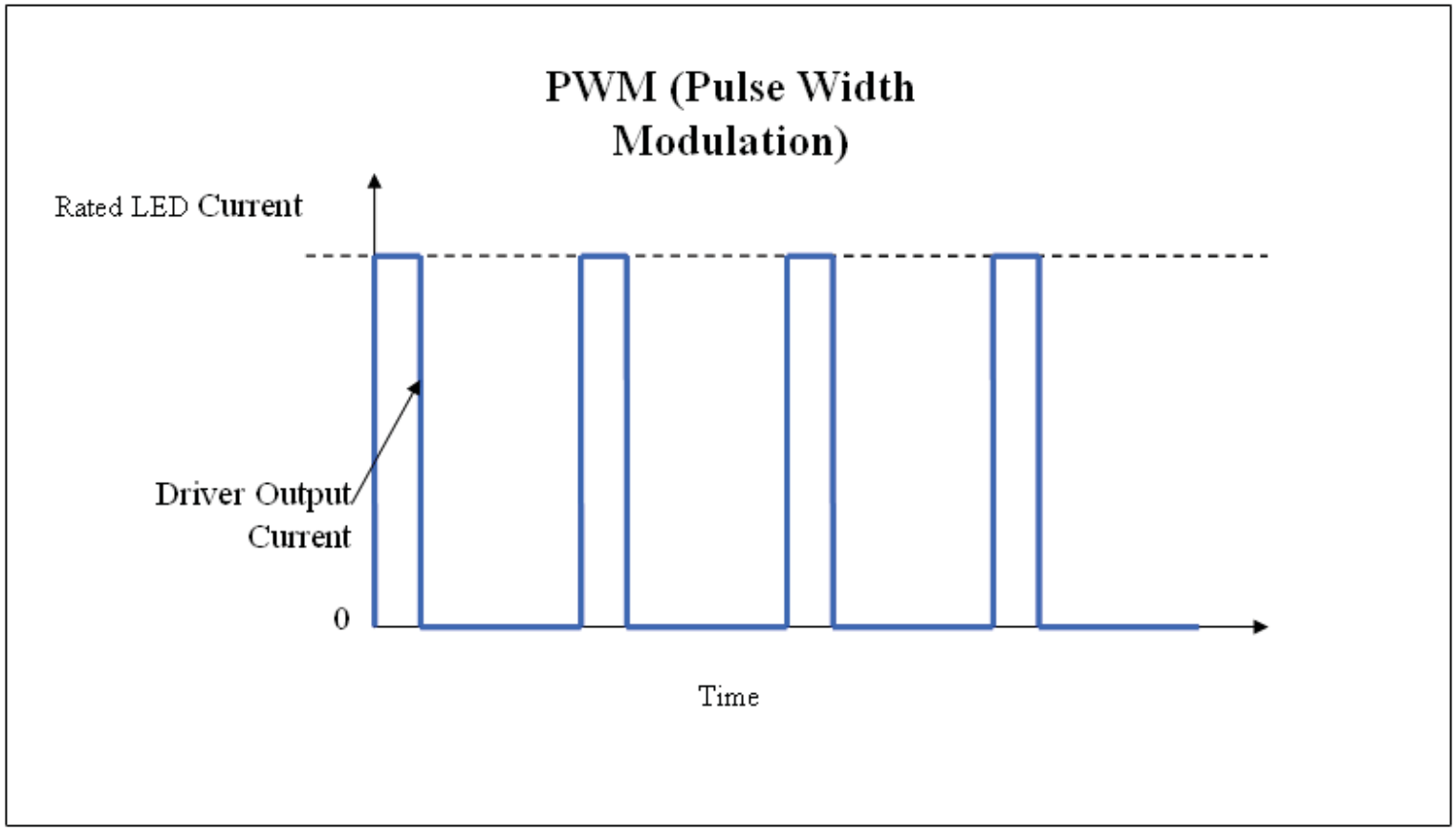
Dimming behind the scenes



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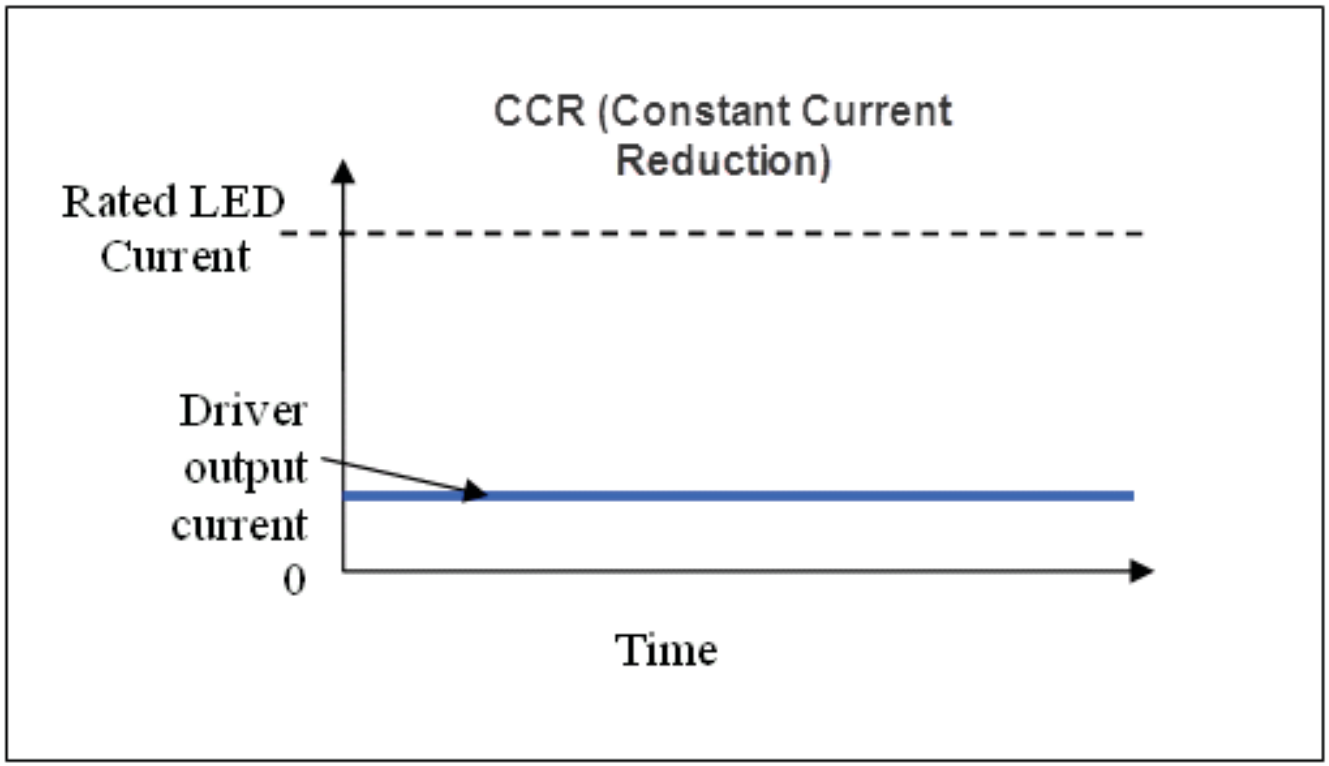
Dimming behind the scenes



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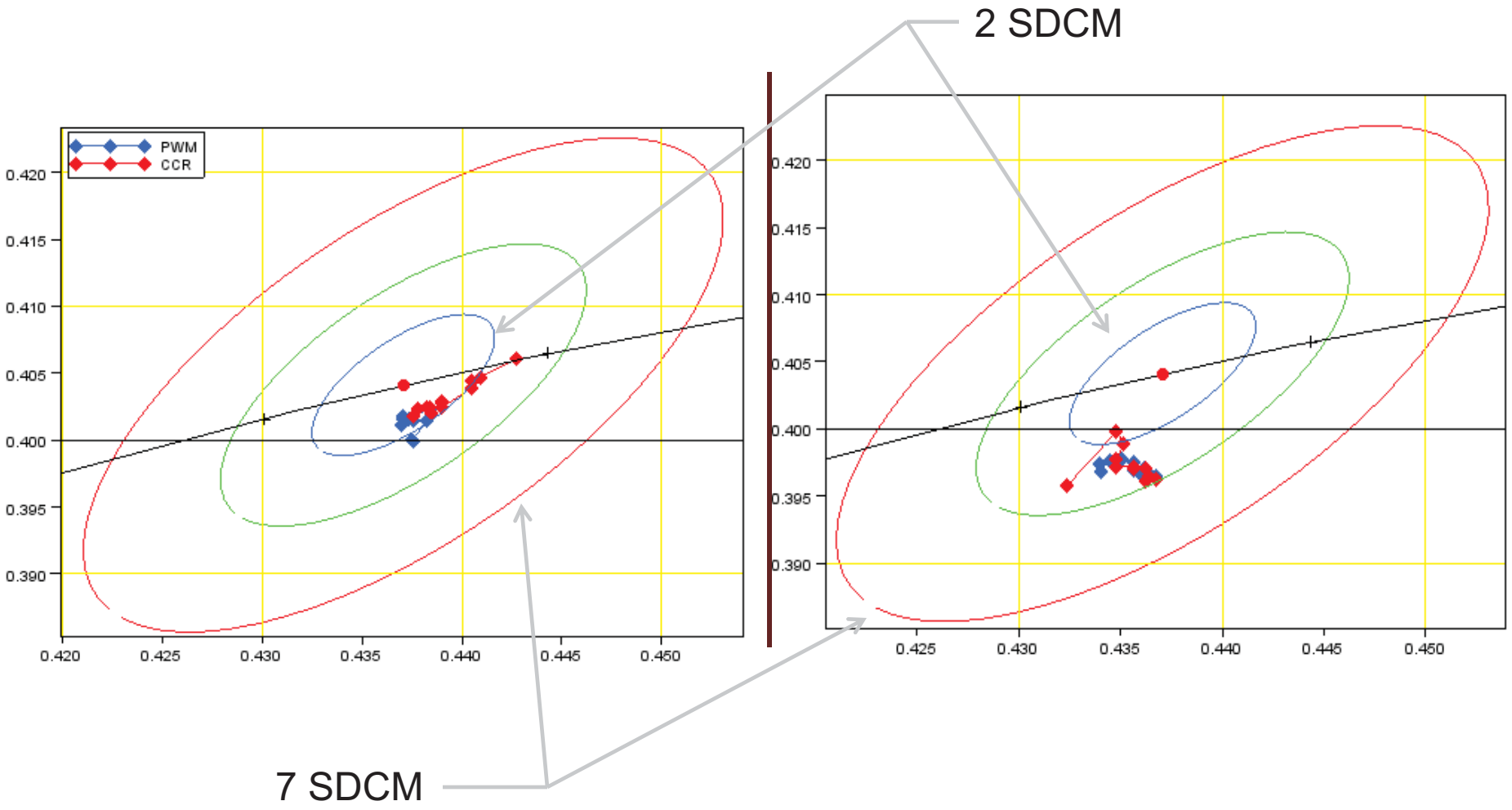
Dimming behind the scenes



Dimming behind the scenes

	PWM	CCR
Color Consistency	X ?	
Lower Risk of Flicker		X
Lower Risk of EMI/RFI		X

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Dimming behind the scenes

		PWM	CCR
Fixtures	LEDi Lamps	X	X
	Constant Current Drivers	X	X
	Constant Voltage Drivers	X	

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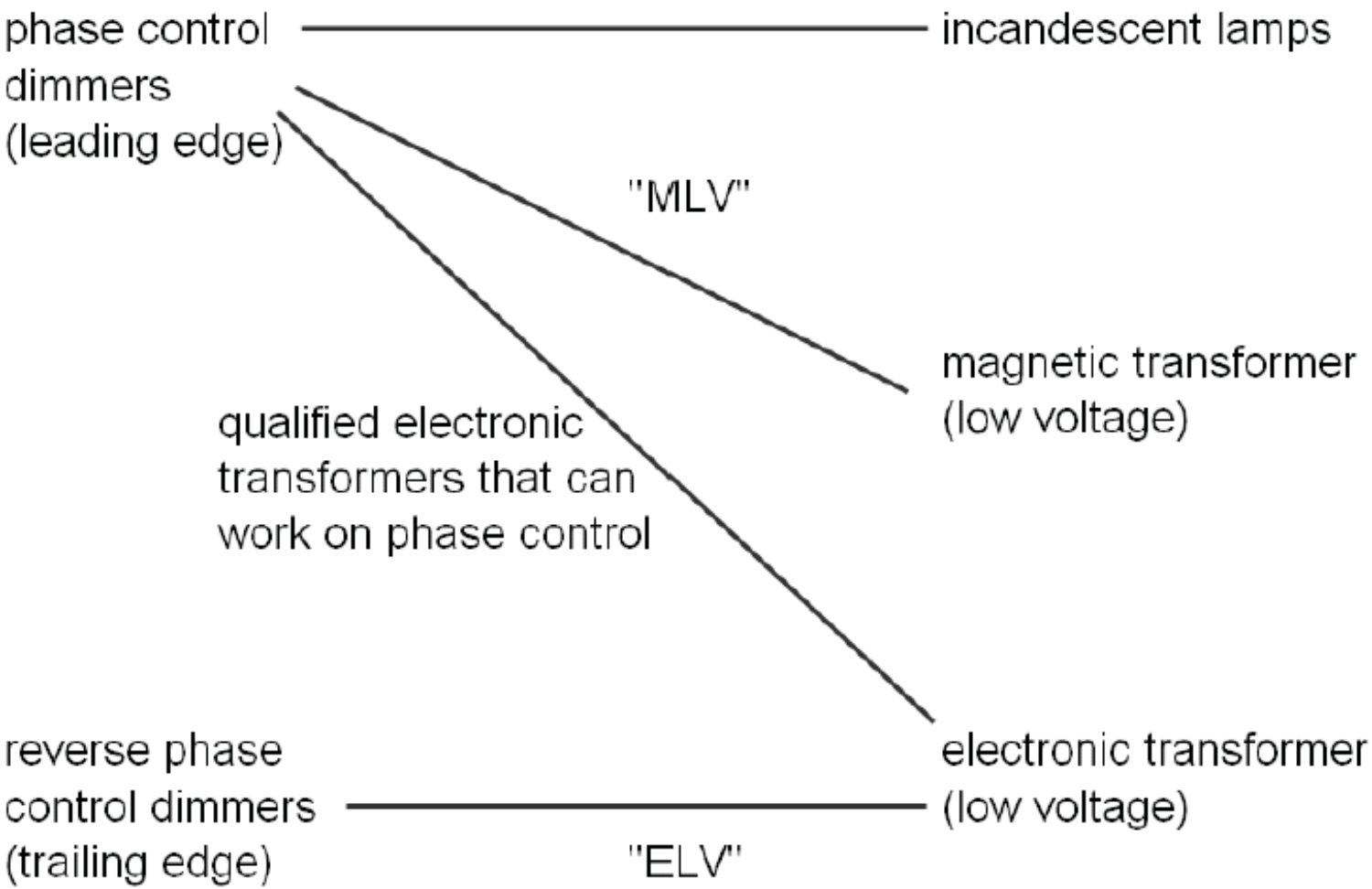
Show and Tell - Demonstration

The current (prior?) world of halogen dimming



The current (future) world of LEDi

phase control dimmers (leading edge) — *"CFL/LED"* — **NEMA SSL-7A LED lamps and/or LED fixures**

reverse phase control dimmers (trailing edge) — "ELV" — **unique LEDs**

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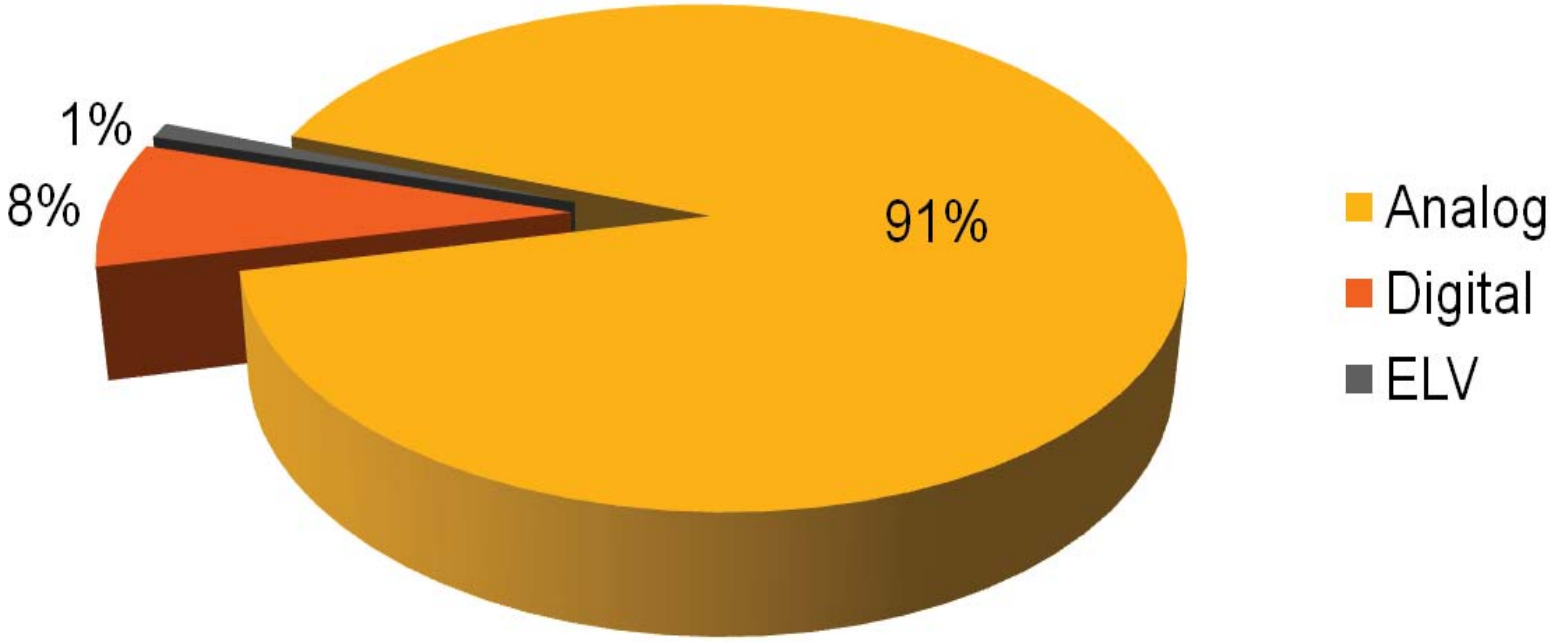
Solid State Lighting Standard - NEMA SSL-7A

What is the significance of this?...



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NEMA SSL-7A

Description

- A forward-looking interface standard for forward-phase dimming of LED loads (both screw-in lamps and fixtures), suitable for global use (100, 120, 230, 277V). Anticipate it being adopted by Zhaga as a requirement for Zhaga-compliant phase-dimmable loads. It is not primarily designed for compatibility with existing installed dimmers or LEDs.

Primary Contributors

- Controls: Lutron, Leviton, Legrand
- Lamps: Philips, GE, Sylvania
- Other: UL, NXP (lamp chipset), Infineon (lamp chipset)

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NEMA SSL-7A

Included

- Specifications to ensure reliability and basic performance of dimmers and LED loads. It provides requirements for lamps and controls in regards to inrush current, repetitive peak current/voltage, high end/low end, and on- and off-state leakage.

NOT Included

- Performance/aesthetic characteristics, such as dimming smoothness, flicker, audible noise. This is proposed to be in an upcoming SSL-7B version.

Status

- First draft was accepted unanimously within NEMA in December 2012. Final version is out for vote now. Should be publishing publically in April.

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NEMA SSL-7A

In order to enable a wide range of products, lamp manufacturers required that two categories of LED lamps and dimmers be defined:

	Type 1	**Type 2**
LED Lamps	Does not allow current for a dimmer's power supply to flow through lamp	Allows current through lamp in order to charge dimmer's power supply

	Type 1	**Type 2**
Dimmers	Requires no current to flow through load (dimmer has no power supply, or has a neutral wire) *Example*: Slide Dimmer (Analog)	Allows larger current through the load to run dimmer's power supply (up to 150mW, primarily for non-neutral dimmers) *Example*: Microprocessor Dimmer

For more on NEMA SSL-7A, attend the session entitled:

Are we there yet? Using NEMA-SSL7A for LED Dimming

(#L13S36)

Thursday, April 25 at 10:30am, Room #103B

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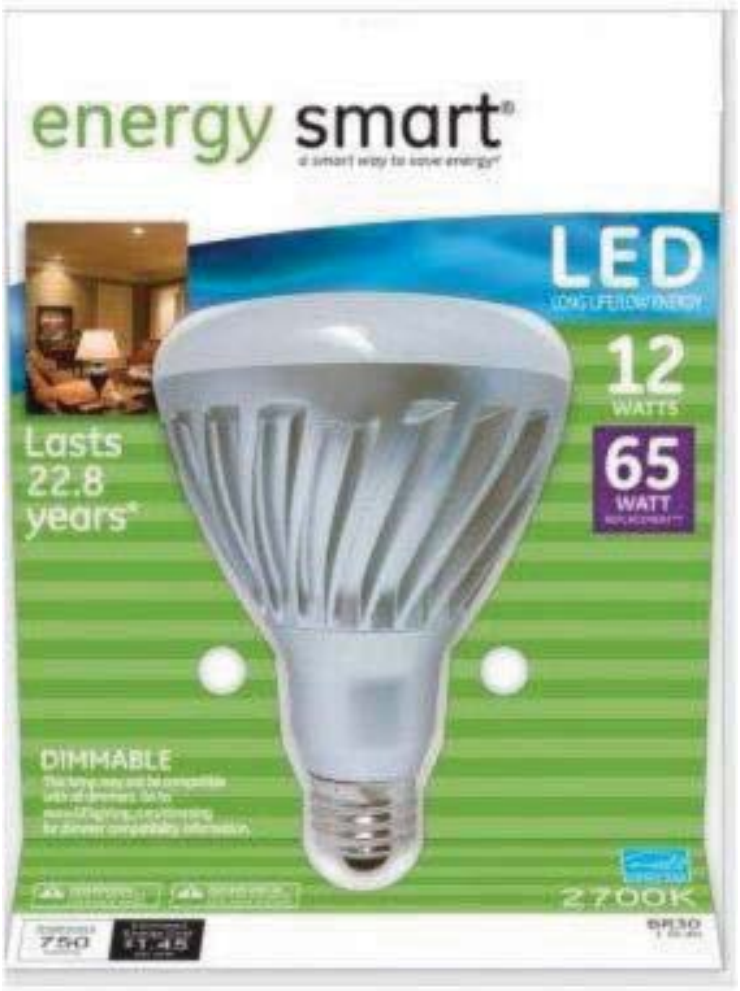
Inside the numbers...

Scenario 1 –ROI of Simple Lamp Replacement



Inputs	Incumbent (INC)	Replacement (LED)
Lamp	65BR30	12R30 (LED)
Lumens	725	750
Rated Life	2,500	25,000
Cost	$ 3.33 (Lowe's)	$ 56.00 (Amazon)
Power Factor	1.00	0.73

Assumptions	
Connected Load to be replaced (kW/kVA)	50 / 62.5
Building Power Factor	0.80
Operating Hours	2,340
Utility Energy Rate ($/kWh)	$ 0.0947
Utility Rebate per Lamp	$ 15.00
New Dimmer	$ 17.00
Neutral Wire to Dimmer ($/lf)	$ 28.00

Inside the numbers...

Scenario 1 –ROI of Simple Lamp Replacement

Inside the numbers...

Scenario 1 –ROI Lamp Replacement with Dimmer and Neutral

Hospitality Conundrum

Scenario 2 – Lighting Efficiency Measures

- Client Seeking Utility Rebate for Lighting Redesign
- INC to CFL already done
- Improve Guest Feedback
- Design Driven Efficiency
- Maintain Brand Standards
- Guest Experience

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Hospitality Conundrum

Scenario 2 – Lighting Efficiency Measures (CFL to LEDi)

Discount Rate	12.5%	Electricity		
Hurdle Rate	20%	Usage ($/kwh)	$	0.0547
Terminal Value Multiplier	7.5	Demand ($/kw)	$	15.415
CPI Inflation	2.20%			
Energy Inflation	0%	Blended Rate ($/kwh)	$	0.0995

Year		0	1	2	3	4	5	
Construction and/or equipment costs	$	15,314.00						
Engineering & consulting fees	$	765.70						
Finance origination fees	$	-						
Revenue lost during downtime/project installation	$	-						
Other capital cost	$	-						
Value of incentive or rebate								
Other capital offset subtracted from total	$	-						
Other One Time Investments			$ -	$ -	$ -	$ -	$ -	
Total Investment	**$**	**16,079.70**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	
Usage Savings/(Expense)			$ 233.36	$ 233.36	$ 233.36	$ 233.36	$ 233.36	
Demand Savings/(Expense)			$ 295.23	$ 295.23	$ 295.23	$ 295.23	$ 295.23	
Incremental Energy Savings/(Expense)	**$**	**-**	**$ 528.59**	**$ 528.59**	**$ 528.59**	**$ 528.59**	**$ 528.59**	
Incremental Maintenance Savings/(Expense)			$ 894.62	$ 914.30	$ 934.41	$ 954.97	$ 975.98	
Incremental Other non-capital Savings/(Expense)			$ -	$ -	$ -	$ -	$ -	
Incremental Revenue			$ -	$ -	$ -	$ -	$ -	
Total Incremental Savings/(Expense)	**$**	**-**	**$ 1,423.21**	**$ 1,442.89**	**$ 1,463.00**	**$ 1,483.56**	**$ 1,504.57**	
								Terminal Value
Cash Flow From Operations - Investments	**$**	**(16,079.70)**	**$ 1,423.21**	**$ 1,442.89**	**$ 1,463.00**	**$ 1,483.56**	**$ 1,504.57**	**$ 11,284.27**
Cash Flows + Terminal Value	**$**	**(16,079.70)**	**$ 1,423.21**	**$ 1,442.89**	**$ 1,463.00**	**$ 1,483.56**	**$ 12,788.84**	

NPV: $ 4,623.97
IRR: 4%

Hospitality Conundrum

Scenario 2 – Lighting Efficiency Measures (Table Lamps)

Discount Rate	12.5%	Electricity		
Hurdle Rate	20%	Usage ($/kwh)	$	0.0547
Terminal Value Multiplier	7.5	Demand ($/kw)	$	15.415
CPI Inflation	2.20%			
Energy Inflation	0%	Blended Rate ($/kwh)	$	0.0995

NPV: $ 14,328
IRR: 30%

Year		0	1	2	3	4	5	
Construction and/or equipment costs	$	20,862.00						
Engineering & consulting fees	$	417.24						
Finance origination fees	$	-						
Revenue lost during downtime/project installation	$	-						
Other capital cost	$	-						
Value of incentive or rebate	$	(1,824.00)						
Other capital offset subtracted from total	$	-						
Other One Time Investments		$	- $	- $	- $	- $	-	
Total Investment	**$**	**19,455.24**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	
Usage Savings/(Expense)		$	666.74 $	666.74 $	666.74 $	666.74 $	666.74	
Demand Savings/(Expense)		$	843.53 $	843.53 $	843.53 $	843.53 $	843.53	
Incremental Energy Savings/(Expense)	**$**	**-**	**$ 1,510.26**	**$ 1,510.26**	**$ 1,510.26**	**$ 1,510.26**	**$ 1,510.26**	
Incremental Maintenance Savings/(Expense)		$	2,683.85 $	2,742.89 $	2,803.23 $	2,864.90 $	2,927.93	
Incremental Other non-capital Savings/(Expense)			$	- $	- $	- $	-	
Incremental Revenue			$	- $	- $	- $	-	
Total Incremental Savings/(Expense)	**$**	**-**	**$ 4,194.11**	**$ 4,253.15**	**$ 4,313.50**	**$ 4,375.17**	**$ 4,438.20**	
								Terminal Value
Cash Flow From Operations - Investments	**$**	**(19,455.24)**	**$ 4,194.11**	**$ 4,253.15**	**$ 4,313.50**	**$ 4,375.17**	**$ 4,438.20**	**$ 33,286.47**
Cash Flows + Terminal Value	**$**	**(19,455.24)**	**$ 4,194.11**	**$ 4,253.15**	**$ 4,313.50**	**$ 4,375.17**	**$ 37,724.67**	

Market Considerations

- Downlights
- Track
- Decorative
- Exterior

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Market Considerations

File E34957 Vol. 4 Sec. 58 and Report Page 1A Issued: 2012-03-10 New: 2013-02-11

The devices can be identified as follows:

CATALOG NUMBER BREAKDOWN:

Similarities - The following catalog numbers are identical with the exceptions noted below.

Cat. No	Identical to Cat. No.	Exception
MACL-153M	MACL-150M	Marketing Purposes
MACL-150	MACL-150M	Single-pole (no blue terminal)
MACL-150M#CPW2000	MACL-150M	Ratings
MACL-150M#CPW2500	MACL-150M	Ratings
MACL-153	MACL-150M	Marketing Purposes
MACL-153M#CPW2000	MACL-150M	Ratings
MACL-153M#CPW2500	MACL-150M	Ratings
MACL-150#CPW2000	MACL-150M	Ratings
MACL-150#CPW2500	MACL-150M	Ratings
MACL-153#CPW2000	MACL-150M	Ratings
MACL-153#CPW2500	MACL-150M	Ratings

Cat. Nos. with a 150 W CFL/LED rating are for use only with lamps indicated in the 150 W column in Table A.

Market Considerations

Table I

Rev J		UL File	List is sorted by UL File, Lamp Model then Lamp Mfg.	Lamp Watt-age Rating	Dimmer Wattage Rating		
CFL/ LED	Lamp Mfg.		Lamp Model		150	200	250
L	Cree	3RBA	CE-JB4-600L-27K	12.5	X	X	X
L	Cree	3RBA	CE-JB6-650L-27K-E26	12.5	X	X	X
L	Cree	3RBA	ECO-575L-50K	12.5	X	X	X
C	Philips	E130360	EL/APAR38DIM20W	20	X	X	
C	Philips	E130360	EL/AR30DIM16W	16	X	X	X
C	Philips	E130360	EL/AR30DIM16W	16	X	X	
C	Philips	E130360	EL/AR40DIM20W	20	X	X	
C	Philips	E130360	EL/AR40DIM20W	20	X	X	X
C	Philips	E130360	EL/dt DIM 32W	32	X	X	X
C	Philips	E130360	EL/mdt DIM 15W	15	X	X	
C	Philips	E130360	EL/mdt DIM 20W	20	X	X	X
C	Philips	E130360	SLS/D	23	X	X	X
C	Osram Sylvania	E137657	CF14EL/R20/DIM	14	X		
C	Osram Sylvania	E137657	CF14EL/TWIST/DIM	14	X		
C	Osram Sylvania	E137657	CF15EL/BR30/DIM	15	X	X	X
C	Osram Sylvania	E137657	CF19EL/BR40/DIM	19	X		
C	Osram Sylvania	E137657	CF24EL/TWIST/DIM	24	X		
C	Osram Sylvania	E137657	CF5EL/B10/827/L/DIM	5	X	X	X

Lighting Sommelier

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Lighting Sommelier

Cow from the U.S.

Grapes from Argentina

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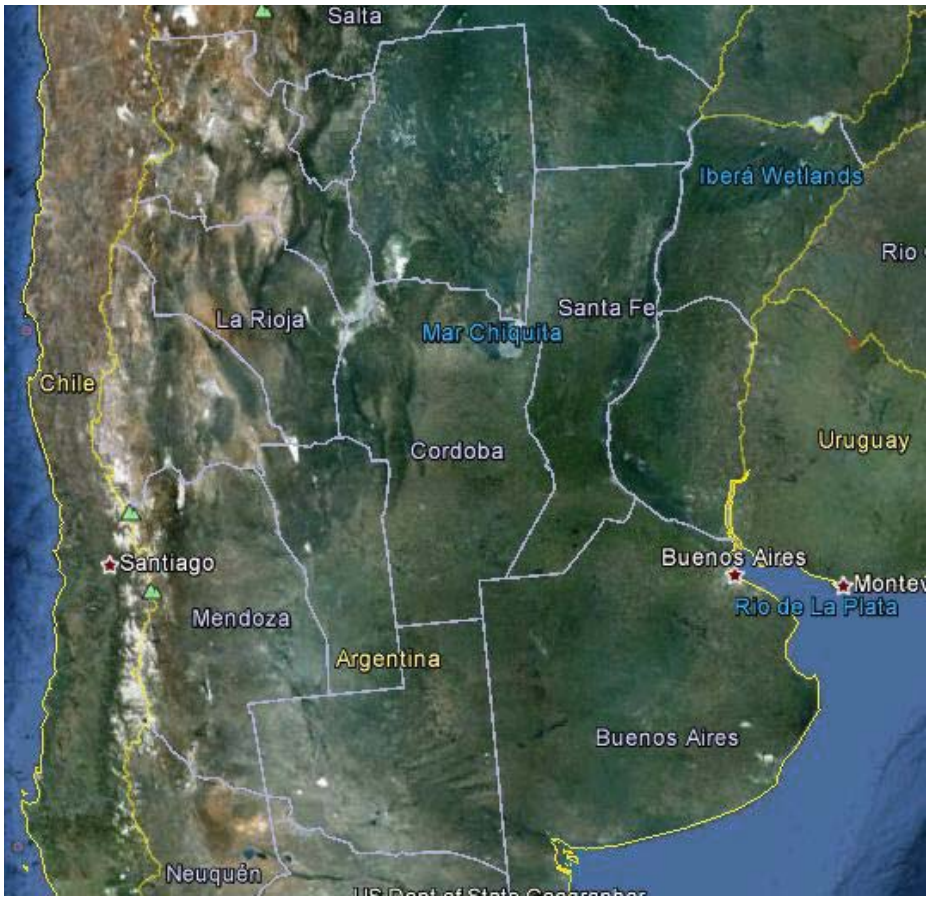
Lighting Sommelier

Farm in Iowa

Vineyard in Cordoba region



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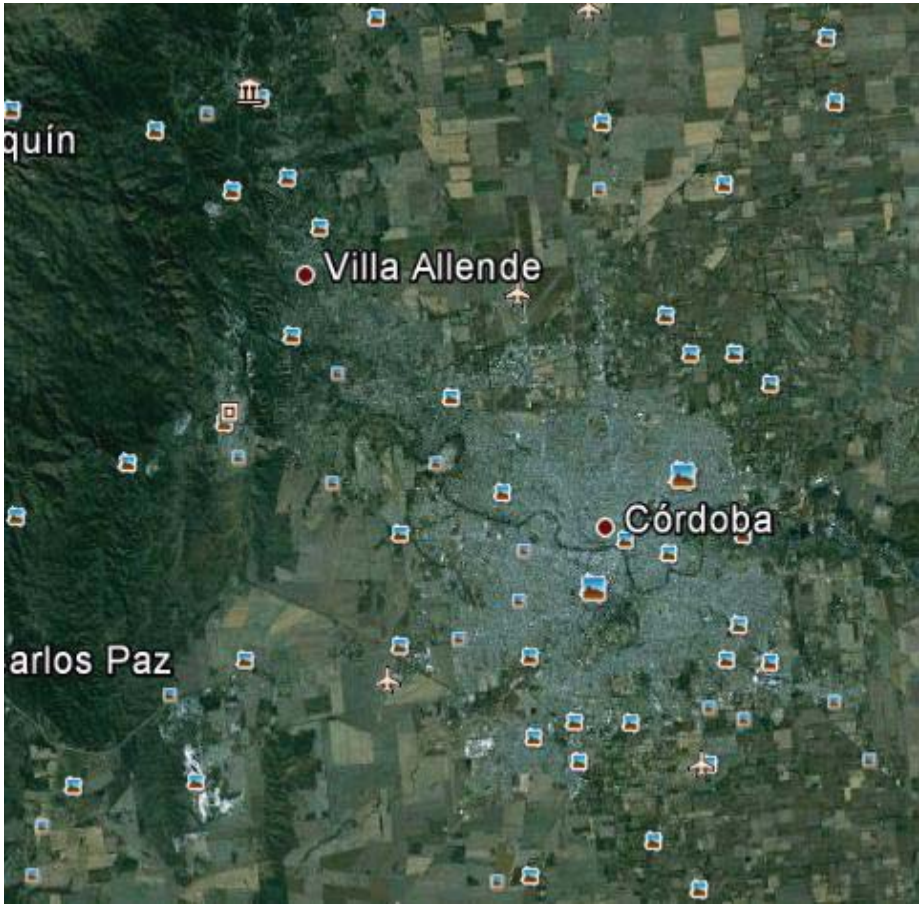
Lighting Sommelier

Farm in Des Moines

Vineyard in Villa Allende



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Lighting Sommelier

This farm here

This vineyard here

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Design Guidelines

"... a lamp's performance with one dimmer does not predict its performance with another."

- Consider using report cards from manufacturers to ensure performance for line voltage and low voltage solutions
- Mock ups and demos with owner present early in the design development
- Ask for more information than the current specification sheets provide – PF, THD, dimming range, PWM/CCR)
- Do not allow substitutions – one variable change can significantly impact performance
- Work to understand existing conditions – wiring, controls
- Consult with knowledgeable and professional lighting experts

Dim the lights - the next steps in truly shrinking our energy footprint is to save energy while the lights are still on!!

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Sommelier :: Lighting Designer

The Princeton Review

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- Day in the Life
- Quality of Life
- Present & Future
- Facts & Figures
- Majors

Back to Career Search

Career: Sommelier

Save

A Day in the life of a Sommelier

Sommelier is the French term for cellarmaster or wine steward. Sommeliers are individuals with a love of wine who are eager to impart some of their knowledge to the customer. They can describe the regions, grapes, vineyards and vintages of an assortment of wines. Many patrons are easily intimidated by wines and do not understand the terminology used to describe them. *The sommelier must be ready to coax from patrons a description of their desires and be understanding of their budgetary limits.*

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- Day in the Life
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Back to Career Search

Career: ~~Sommelier~~ Lighting Sommelier

Save

A Day in the life of a Sommelier

Lighting Sommelier ~~Sommelier~~ is the ***American*** ~~French~~ term for ***light*** ~~wine~~ steward or ***lumen pusher*** ~~cellar master~~. ***Lighting Sommeliers*** ~~Sommelier~~ are individuals with a love of ***light*** ~~wine~~ who are eager to impart some of their knowledge to the customer. They can describe the ***color*** ~~regions,~~ ***lumen output*** ~~grapes,~~ ***manufacturers*** ~~vineyards,~~ and vintages***,*** of an assortment of ***lamps*** ~~wines~~. Many patrons are easily intimidated by ***lamps*** ~~wines~~ and do not understand the terminology used to describe them. *The* ***Lighting Sommelier*** ~~*sommelier*~~ *must be ready to coax from patrons a description of their desires and be understanding of their budgetary limits.*

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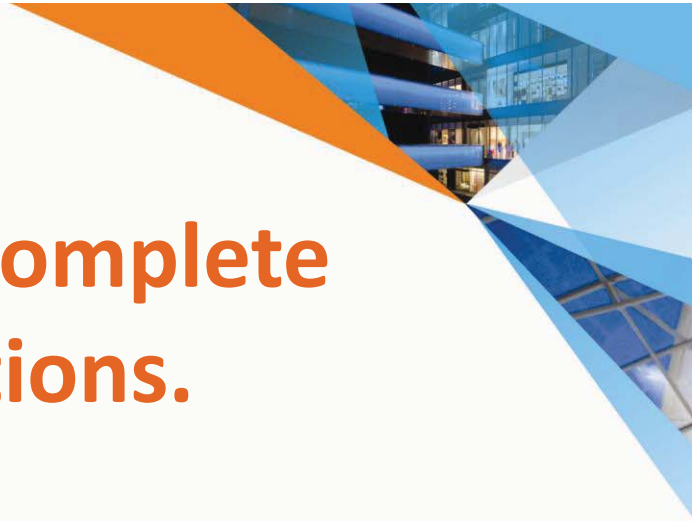

Please remember to complete the course evaluations. Thank you.

We hope you enjoy the trade show and conference!

We hope to see you at LFI 2014!
www.lightfair.com