

De Anza ES 74 Lighting - Lecture #3

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Instructor

Logistics

- Class Website
<http://bhs.deanza.edu/faculty/sGould/index.htm>
- Field Trip
- Assignments due
- My email is scott.gould@stanford.edu

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Review Lecture 2

- T5 Lamps
- Lighting Controls
- Lamp Disposal
- Group Relamping

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Induction Lighting

- Induction coil used to create a magnetic field inside a electron/ion plasma
- Advantages
 - Very long life 60,000 to 100,000 hrs
 - Good color, no flicker, good lumen maintenance
 - Very good efficiency - 75 lumens/watt
- Disadvantages
 - First cost
- Manufacturers
 - Osram - Icetron
 - Phillips - QL lamps

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Philips QL lamp



Sylvania Osram Icetron

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<http://www.lighting.philips.com/feature/ql/faq.php>

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Light Emitting Diodes

- Semiconductor Diode, electronic device
- Color depends on semiconductor material
- White light can now be made by light from different parts of the spectrum

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LED -- Indication v Illumination

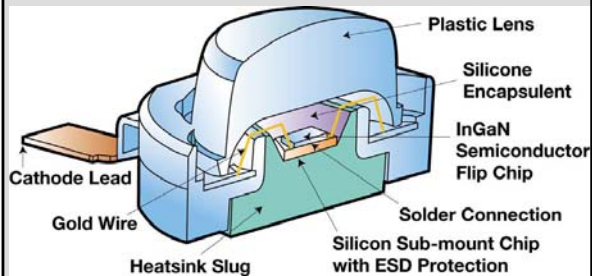
- Signs and Signals
- General lighting, task lighting

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LED Section



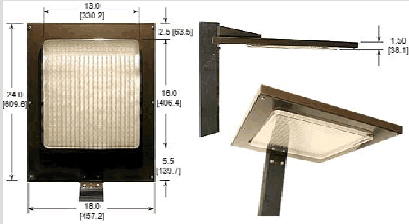
https://public.ornl.gov/conf/nanosummit2004/talks/9_Craford.pdf

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LED Streetlight



Ledtronics, Inc

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Future of LEDs

Colored Lighting: LEDs are replacing conventional sources and enabling new applications.

Low Power White Lighting: LEDs are moving into a wide variety of niche applications.

General Illumination: Efficiency and cost breakthroughs must be achieved to enable LEDs to substantially replace conventional lighting.

https://public.ornl.gov/conf/nanosummit2004/talks/9_Craford.pdf

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LED Energy and Environmental Benefits

- Minimal disposal required
- No mercury
- Potential savings of \$17B in annual energy costs (30 large power plants)
- Potential reduction on CO₂ emissions of 155 million tons

https://public.ornl.gov/conf/nanosummit2004/talks/9_Craford.pdf

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LED Resources

Lumileds Presentation 2004

https://public.ornl.gov/conf/nanosummit2004/talks/9_Craford.pdf

Energy Savings Potential of Solid State Lighting in
General Illumination Applications

<http://www.netl.doe.gov/ssl/pdfs/SSL%20Energy%20Savings%20Final.pdf>

Lighting Answers NLRIP

<http://www.lrc.rpi.edu/programs/NLRIP/publicationDetails.asp?id=885&type=2>

SANDIA Labs

<http://lighting.sandia.gov/Xlightingoverviewreview.htm>

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The "Ins and Outs" of Exit Signs

- Old Technology = Incandescent
 - 40 to 50 watts, 8 months life!
- First Generation Retrofit-Fluorescent
 - 10 to 20 watts, 2 years
- Latest Technology - LED
 - Less than 5 watts, 25 years!

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Daylighting

- Admit only as much light as necessary.
- Consider sky conditions and glare control.
- Daylight dimming controls can save significant amounts of energy.
- Daylighting can reduce heating loads.
- Glazing is a key ingredient.
 - Spectrally selective tints reduce heat gain but allow visible light.

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What Light Shelves Do

- Light shelves balance illumination level across the space, rather than increasing it deeper into the space.
- Because illumination level is more even, our eyes perceive greater brightness farther from the window.

November 26, 2002 ES 71: Building Envelope
 From Ryan Stroupe, PG&E

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Daylighting cont.

- Skylights
- Light Pipes
 - Fit through ceiling joists
- Light Shelves
- Shading Devices

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Daylighting

Daylighting options and devices

<http://www.arch.hku.hk/teaching/SBT99/SBT99-02/sld027.htm>

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Title 24 Lighting

2001 CA Standards available for downloading

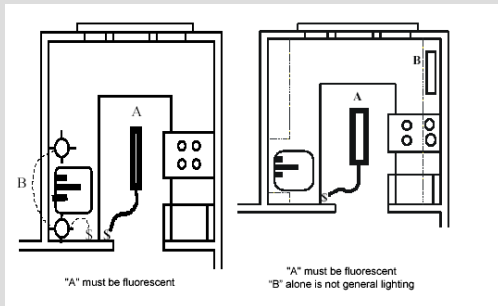
<http://www.energy.ca.gov/title24/standards/>

- Residential
- Nonresidential (Commercial/Industrial)
- The standards (along with standards for energy efficient appliances) have saved more than \$20 billion in electricity and natural gas costs. It is estimated the standards will save \$57 billion by 2011.

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<http://www.energy.ca.gov/title24/standards/>

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Summary of Lighting Energy Saving Opportunities

- Assess the lighting needs first!
 - Quality and Quantity of the light
- Take advantage of "Free Lighting"
 - Daylighting
- Convert to a more efficient source
 - Incandescent to Fluorescent
 - Mercury vapor to Fluorescent or Metal Halide
- Improve the efficiency of the existing source.
 - T12 lamps to T8 or T5 lamps
- Install lighting controls
 - Time clocks, occupancy sensors, dimmers

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Review Lecture 3

- Lighting Controls
- Lamp Disposal
- Group Relamping
- Daylighting
- Title 24

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Course Objectives

- Explore how light is produced and delivered by examining various lighting technologies and the efficiency associated with each technology
- Explore the relationship between lighting, vision, and human perception
- Examine the benefits and applications of compact fluorescent lighting
- Examine the benefits and applications of fluorescent lighting

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Course Objectives cont.

- Assess the essential role of ballasts in a lighting
- Explore the various types of lighting controls and the benefits of their use
- Examine principles, applications and technologies for exterior lighting
- Explore the theory and benefits of daylighting as an alternative to electric lighting
- Explore the life cycle benefit of different lighting options in retrofit and new construction applications.

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