

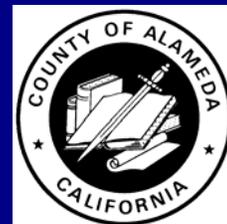
*How to Purchase Green Lighting  
Equipment*

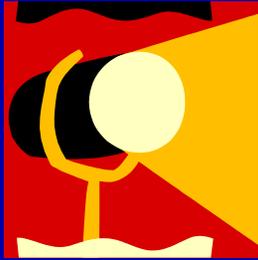
Association of Bay Area Governments  
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How to Structure Bids  
for Green Lighting Equipment  
and Qualify for LEED Credits

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# Presentation Overview

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- **Discusses how lamps are purchased**
- **Describes how to specify environmentally preferable lamps and ballasts**
- **Identifies options for evaluating bids and negotiating prices**
- **Details how to calculate the amount of mercury in lamps for LEED (green building) credit**

# Who Should be at the Table?

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- **Energy Managers, Electricians**
- **(Green) Building staff**
- **Purchasing agents**
- **Pollution Prevention staff**
- **End-users in individual agencies**
- **Consultants who specialize in energy efficiency and lighting**



# Opportunities for Environmentally Preferable Lighting Equipment

- Lamp, Ballast and Fixture Contracts
- Service Agreements
- Group Re-lamping Initiatives
- Lighting Retrofits
- (Green) Building Construction and Renovation Projects
- Fluorescent Lamp Distribution Programs
- Work with Retailers and Utilities
- Contracts for Vehicles and Furniture



# How Are Lamps Purchased?

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- Individual purchases at retailers
- Individual online purchases
- Purchases from lighting distributor
- Local government contract
- State of California contract
- Cooperative purchasing agreement



# Traditional Lighting Contracts

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- **Vendors represent one (or more) lighting product manufacturer(s)**
- **Agencies/businesses purchase off manufacturer's catalog with negotiated price discounts**
- **No/few restrictions on types of lamps that can be purchased**



# Establish Timelines

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- **Approximately 6 months before contract expires**
- **Coordinate with green building design (review lamp fixture schedule proposed by architects)**

# Conduct Research

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- **Evaluate current or anticipated lamp usage**
  - ◆ Use lamp audit form on CD
  - ◆ Look for opportunities for improvement
- **Review information in lamp catalogs (efficacy, lamp life, etc.)**
- **Gather mercury and lead content information from manufacturers**
- **Compare prices on environmentally preferable lamps**





# Get User Input – Early and Often

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- **Ask facility managers, electricians and other end-users to participate in decisions about which products to use**
- **Find out their experiences with various products**
- **Coordinate plans for lighting retrofits, re-lamping, procurement, recycling**
- **Establish an exemption process for special needs**

# Identify Relevant Policy Drivers

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## State of California's Executive Order S-20-04

- ◆ Commits state agencies to reduce energy use 20% by 2015 through aggressive action on energy-efficiency and green building
- ◆ Commits to LEED Silver in designing, constructing and operating all new and renovated state-owned facilities

See [www.usgbc.org/Docs/News/News1217.pdf](http://www.usgbc.org/Docs/News/News1217.pdf)



# Local Policies Driving EP Lamps

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## Alameda County PBT Reduction Policy

- ◆ Commits to reducing mercury and other persistent toxic chemicals in County operations



## San Francisco's Ordinance on Resource Efficiency and Green Building

- ◆ Prohibits installation of T12 ballast and incandescent exit signs and commits to LEED standards

# Factors to Consider When Evaluating Lighting Equipment

- **Energy Efficiency**
- **Lamp life**
- **Toxic chemical content**
  - ◆ **Mercury and Lead**
- **Compatibility with ballasts, fixtures**
- **Other performance issues (e.g., color, CRI)**
- **Initial Price and Life-cycle Costs**
- **Manufacturer's Recycling Program**
- **Aesthetics**



# Bid Specs: Energy Efficiency

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## Restrict sales of inefficient lighting equipment

- ◆ Mercury vapor ballasts/lamps
- ◆ T12 and T9 (circular) ballasts/lamps
- ◆ Less-efficient (preheat) T8 lamps/ballasts
- ◆ Incandescent lamps/fixtures/  
exit signs
- ◆ Generic lamps and ballasts when more  
efficient models are available



# Bid Specs: Energy Efficiency (continued)

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- **Never specify new T12 ballasts or fixtures**
  - ◆ Low-efficiency compared to T8s and T5s
  - ◆ High mercury (especially non-4-foot models)
  - ◆ Relatively short lamp life
  - ◆ Poor color
  - ◆ Magnetic ballasts hum
- **Upgrade to T8s or T5s ASAP (with new ballast)**
- **If NEED to replace T12 lamp, upgrade to more efficient, low-mercury model with 80+ CRI**



# Nevertheless...

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**Of the 1.5 billion fluorescent lamps installed in the US commercial sector, 58% are still T12s.**

Source: CA Energy Commission, Best Practices Guide: Lighting, 2005, [www.fypower.org/bpg/module.html?b=offices&m=Lighting](http://www.fypower.org/bpg/module.html?b=offices&m=Lighting)

**Most retailers continue to offer a wide range of fixtures, ballasts and lamps that use T12 technology.**



# Upgrade Standard T8s

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- Upgrade lamps immediately to long-life, low-mercury T8s, if practical
- De-lamp if possible using premium lamps
- Upgrade ballasts when they start to burn out
- Look for cost-effective retrofit opportunities



# Specify T8s with More Lumens

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## ■ First Generation 4-ft T8: 2660 mean lumens

- ◆ GE: F32T8/**SP41**/ECO
- ◆ Philips: F32T8/**TL741**/ALTO
- ◆ Sylvania: FO32/**741**/ECO (2520 mean lumens)

## ■ Second Generation 4-ft T8: 2800 mean lumens

- ◆ GE: F32T8/**SPX41**/ECO
- ◆ Philips: F32T8/**TL841**/ALTO
- ◆ Sylvania: FO32/**841**/ECO (2710 mean lumens)

## ■ Third Generation/Premium 4-ft T8: 2950 mean lumens

- ◆ GE: F32T8/**XL/SPX41/HL**/ECO
- ◆ Philips: F32T8/**ADV841**/ALTO
- ◆ Sylvania: FO32/**841/XPS**/ECO (2992 mean lumens)

# Energy Efficiency of Various Lamp Types (Examples)

Lamp Type	Watts (W)	Lumens (L)	Efficacy (L/W)
Incandescent	100	1710	17.1
Halogen (Par 38)	100	2200	22.0
HID, Mercury Vapor*	100	3700	37.0
HID, Ceramic Metal Halide*	100	6600	66.0
Linear Fluorescent, T12*	34	2300	67.6
Compact Fluorescent*	23	1600	69.6
Linear Fluorescent, T8*	32	2800	87.5
Linear Fluorescent, T5HO*	54	4750	88.0
HID, High-pressure Sodium*	100	8850	88.5
Linear Fluorescent, T5*	28	2750	98.2

*\*System efficacies may be slightly different due to impact of ballast.*

# Specify Energy-Efficient Systems

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**Take into consideration both lamp and ballast**  
**Link procurement with retrofits**

Lamp + Ballast System Description	System Watts (W)	System Mean Lumens (L)	System Efficacy (L/W)
<b>32-watt T8/841 + Extra-efficient Instant Start (IS) (.87 BF) Ballast</b>	<b>26.5</b>	<b>2,436</b>	<b>92</b>
<b>28-watt T5 + Generic IS (1.0 BF) Ballast</b>	<b>32</b>	<b>2,720</b>	<b>85</b>

*Data from Stan Walerczyk, Lighting Wizards*

# Look for Certified Energy-Efficient Products

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**Some lighting equipment may feature Energy Star (national program) or Title 24-compliant (California program) labels**

- ◆ **Fixtures for fluorescent lamps**
- ◆ **Self-ballasted CFLs**
- ◆ **Exit Signs**



# ENERGY STAR vs. Title 24

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**“Most ENERGY STAR fixtures will qualify as high-efficacy luminaires [under California’s new Title 24 Residential Energy Code], although some lower-efficacy or magnetically ballasted ENERGY STAR products may not be compliant.”**

*Source: Resident Lighting Design Guide: Best Practices and Lighting Design to Help Builders Comply with California’s 2005 Title 24 Energy Code, California Lighting Technology Center, 8/1/05,*

<http://cltc.ucdavis.edu/cltc/download.cfm?DownloadFile=87F73503-0A3C-6303-729D7C4E7001C95F>

# Lessons Learned on Energy Efficiency

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- **Beware of lower light levels of some “energy-saving” models**
  - ◆ Energy-saving lamps (ex. Supersaver, Watt-miser, Econ-o-watt) not always most efficient
- **Understand limitations of some high-efficiency lamps**
  - ◆ Color rendering
  - ◆ Lamp life
  - ◆ Compatibility with fixtures, ballasts, dimmers
  - ◆ Temperature restrictions



# Document Cost Savings of Energy-Efficient Lighting Products

Exit Sign Type	Incandescent	Fluorescent	LED
<b>Input power (watts)</b>	<b>40</b>	<b>11</b>	<b>2</b>
<b>Yearly energy (kWh)</b>	<b>350</b>	<b>96</b>	<b>18</b>
<b>Lamp life (years)</b>	<b>0.25-0.5</b>	<b>1-2</b>	<b>10+</b>
<b>Estimated energy cost/yr (\$0.12/kWh)</b>	<b>\$42.00</b>	<b>\$11.50</b>	<b>\$2.20</b>

For more information see, [www.energystar.gov/ia/business/small\\_business/led\\_exitsigns\\_techsheets.pdf](http://www.energystar.gov/ia/business/small_business/led_exitsigns_techsheets.pdf)

# Specify Longer-lasting Bulbs

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- **Research lamp life of various lamp types and brands**
- **Document potential procurement, installation, and disposal cost savings**
- **Establish minimums for all lamp types**

# Compare Rated Life of Various Lamp Types



Lamp Type	Rated Lamp Life (Hrs)
Standard Incandescent	500 – 3,000
Halogen	2,000 – 6,000
Self-ballasted Compact Fluorescent	6,000 – 25,000
Pin-based Compact Fluorescent	10,000 – 20,000
Linear Fluorescent	7,500 – 36,000
High-intensity Discharge (HID)	7,500 – 40,000
High-wattage Induction/LED	50,000-100,000

# Evaluate Lamp Life Within Each Lamp Type

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## ■ 4 foot linear T8 lamp life varies

- ◆ Standard = 20,000 hours
- ◆ Long Life = 24,000 hours
- ◆ Super Long Life = 30,000 hours



- Longest life T8 lamps mostly in standard shapes and sizes
- Make sure lamp life ratings are based on current ballasts (instant start)

# Bid Specs: Long-life Lamps

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- **San Francisco contract requires vendors to supply long-life lamps whenever available**
  - ◆ Vendors must report lamp life for each model sold in quarterly reports to track compliance
- **SF bid excluded 32-watt, 4' T8s with <24,000 hours on rapid start ballasts**
- **Long-life models available for:**
  - ◆ Linear and compact fluorescents
  - ◆ HIDs (high-pressure sodium)
  - ◆ Incandescents



# Include Other Performance Specifications in Bid

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- **UL-listing, where applicable**
- **American National Standards Institute (ANSI) standards, where applicable**
- **Warranties on all products**
- **Minimum experience of manufacturer**



# Sample 4-foot T8 Specs

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- **Minimum mean lumens**
  - ◆ **2800**
- **Minimum lamp life**
  - ◆ **18,000 hours (on instant start ballast)  
based on 3-hour cycle on-off test**
- **Maximum mercury content**
  - ◆ **5 mg; LEED Mercury = 99.2 picograms  
per lumen-hour**
- **ANSI technical specs**

# Sample EPP Self-ballasted CFL Specs



- **Energy Star compliant (self-ballasted only)**
  - ◆ Energy Star sets other technical specs for energy efficiency, CRI, warranty, etc.
- **Lamp life**
  - ◆ Minimum 10,000 hours life (except for miniature and decorative CFLs)
- **Maximum mercury content**
  - ◆ 5 mg (EU standard)

# Sample EPP Pin-based CFL Specs

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- **4-pin CFLs are generally environmentally preferable to 2-pin CFLs**
  - ◆ **More efficient and dimmable**
    - **4-pin CFLs usually run on electronic ballasts while 2-pin CFLs run on magnetic ballasts**
  - ◆ **More long-lasting**
    - **4-pin CFLs usually last 12,000 hours while 2-pin CFLs usually last only 10,000 hours**
- **Set mercury cap at 5 mg**
- **ANSI technical specs**

# Sample High-pressure Sodium Specs

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- **Consider whether you want to continue using HPS lamps due to poor color**
- **Replacements lamps:**
  - ◆ **Long-life models: 30,000+**
  - ◆ **Low-mercury/Lead-free (TCLP, Eco/ALTO)**
  - ◆ **Sylvania Mercury-free HPS (only 24,000 hrs)**
- **ANSI technical specs**
- **Other features (non-cycling, instant re-strike)**

# Add LED Exit Signs, Lamps and Retrofit Kits to Contract

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**Many contracts do not offer LEDs**

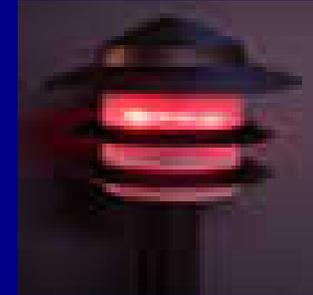
**Restrict from contract incandescent and fluorescent exit signs and lamps**

- ◆ Last 5-10 years
- ◆ Are mercury-free
- ◆ Use less energy than incandescents or fluorescents



**Products should be UL-listed**

# Add Other LEDs to Contract



**Pathway/Garden Lighting**



**Reading Lamps**



**Track and Night Lighting**

**Indoor/Outdoor Flood Lighting  
(MR-16)**



**Decorative/Tree-lighting**

# Document Life-cycle Costs of Various Lighting Options

- ◆ **Initial cost (incl. rebate, replacement)**
- ◆ **Installation costs (labor)**
- ◆ **Energy costs**
- ◆ **Recycling/Disposal costs**
- ◆ **Storage and other maintenance costs**



# Specify Low-toxicity Lamps

- **Restrict vendor sales of high-mercury lamps when low-mercury substitutes are available**
  - ◆ **Set mercury limits based on lamp type**
- **Restrict vendor sales of lead-containing lamps when lead-free replacements exist**



# Require Mercury and Lead Disclosure



**The City and County of San Francisco requires all contractors to provide “full disclosure, to the satisfaction of the purchaser of the amount of mercury or range of mercury in milligrams, for each mercury added product sold. Mercury-added products shall be defined as any device to which elemental mercury or mercury compounds are intentionally added.”**

**In addition, “the presence of lead in solder or glass shall be disclosed for each item sold containing any amount of lead.”**

# Bid Evaluation Options

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## Setting a Bar

- ◆ **Most commonly purchased lamps and ballasts must meet minimum environmental criteria**
- ◆ **Choose low-bid among vendors offering most products meeting criteria**

## Point System (No bar)

- ◆ **Bidders get points for lamps and ballasts with:**
  - **Highest efficacy; longest lamp life**
  - **Lowest mercury; Lead-free components**
  - **Lowest price for high-use items**

# Consider Multiple Awards

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**Increases variety of environmentally preferable lamps on contract**

- ◆ Promotes price competition throughout the life of the contract
- ◆ Contract can be broken up and awarded to different vendors
- ◆ Consider vendors that represent several manufacturers

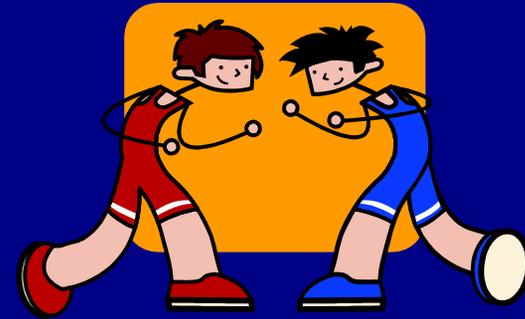


# Foster Competition

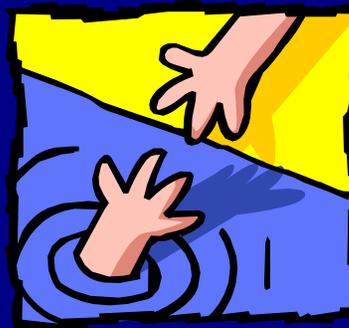
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## Define a competitive bid

- ◆ Multiple manufacturers
- ◆ Multiple vendors
- ◆ Pre-qualify products or manufacturers



## Help purchasing agents find new vendors and products



# Require Contractor Reports

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## Require periodic reporting of lamp usage by lamp contractors

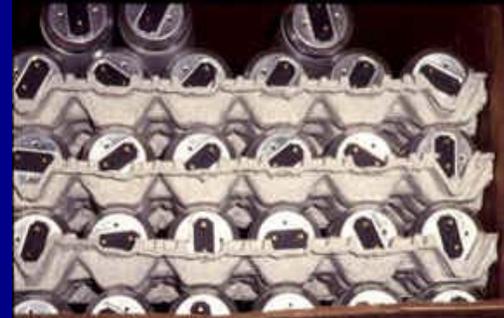
- ◆ SF requires quarterly reports that include lamp type, quantity, buyer, price, mercury/lead content



**Monitor compliance and discuss with vendors and end-users ways to increase purchases of environmentally preferable lamps, ballasts**

# Require Contractor Involvement

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- **Require approved vendors to take back mercury-added lamps at end-of-life (or support jurisdiction's recycling program)**
- **Require vendor training for new products**
- **Request online ordering with **green** products easily identified or excluded items blocked**
- **Hold meetings with contractors to discuss ways to increase use (and decrease cost) of environmentally preferable products**

# Negotiate Prices

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- **Aggregate procurement**
- **Structure bid (and evaluation) to encourage highest discounts on environmentally preferable lamps**
  - ◆ Give preference to vendors that offer large discounts for T8s, T5s, compact fluorescents
  - ◆ Beware of excluded items on price sheets
- **Work with contractors to secure even lower prices on environmentally preferable lamps**



# LEED Mercury Calculation

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## Picograms per lumen-hour

- ◆ **Picogram = 1/1,000,000,000,000 (trillionth) gram**
- ◆ **Mercury = maximum in range (usually reported in milligrams; data should be on MSDS)**
- ◆ **Lumens = MEAN or Design Lumens measured at 40% of lamp life**
- ◆ **Rated Hours must be measured on INSTANT START ballast based on 3 hour starts (except T5s on program start ballast)**

# LEED EB Mercury Reduction Credit

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**LEED Existing Building (EB) prerequisite and credits are based on an AVERAGE, not a MAXIMUM, mercury content**

- ◆ **Expects some over (most CFLs and HIDs, some under (most T8s + T5s)**
- ◆ **Gives companies credit for low-mercury lamps with long-life, high lumen output**

# Easy LEED Mercury Calculation

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**Picograms per Lumen Hour =**

**Maximum mercury (in  
milligrams)**

**x 1,000,000,000**

**÷ Mean Lumens**

**÷ Rated Hours**



# LEED Mercury Calculation for Basic Grade T8s

Lamp Model	Max Mercury	Mean Lumens	Rated Hours	Pico per Lum-Hr
FO32/ 741/ECO	6 mg	2520	15,000	158.7
F32T8/ SP41/ECO	10 mg	2660	20,000	188
F32T8/ TL741/ ALTO	3.5 mg	2660	20,000	66.8

# LEED Mercury Calculation for Long-life, 2<sup>nd</sup> Generation T8s

Lamp Model	Max Mercury	Mean Lumens	Rated Hours	Pico per Lum-Hr
FO32/ 841/XP/ ECO	3.5 mg	2850	18,000	68.2
F32T8/ SPX41/XL /ECO	10 mg	2800	24,000	148.8
F32T8/ TL841/ PLUS/ ALTO	3.5 mg	2800	24,000	52.1

# Barriers to Buying “Green” Lighting Equipment

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- Inadequate labeling on packaging (for mercury, lamp type, etc.)
- Inconsistent reporting of attributes in manufacturers’ catalogs
- Lack of products in retail establishments
- Few environmental specs



# Questions? Comments? Ideas?

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