

# **New Energy-Efficient Lamps, Ballasts, Fixtures & LEDs**

**A Presentation by Effective Lighting Solutions, Inc.**

**for**

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**Presented by**

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# New Compact Fluorescent Lamps



**Source: Philips Lighting**

**PLH CFL & Advance ELB**

- High-ceiling applications
- Fix mfrs have started new designs
- PL-H, 2G8 base
- High lumen RS CFLs
  - 4000 L, 60-w, ~ 7” MOL
  - 6000 L, 85-w, ~ 9” MOL
  - 9000 L, 120-w, ~ 12” MOL
- Long life – 20,000 hrs
  - at 12 hrs/start
- 3000K (warm) & 4100K (cool) appearance (CCT)
- 86 CRI
- 4-pin, dimmable



# New T8 Fluorescent Lamps

- Reduced-wattage 4-foot T8 lamps
  - 25 watts vs. std 32-w      2400 lumens
  - 28 watts vs. std 32-w      2725-2750 L
  - 30 watts vs. std 32-w      2850 lumens
- Designed to replace 34-w T12 reduced wattage lamps (SS, EW WM)
- For applications that can tolerate less light
- Lumen maintenance = 94%
- TCLP compliant
- Philips 25-w
- GE 28-w
- Osram Sylvania 25, 28 & 30-w



# ENERGY SAVING 25, 28 & 30W F32T8s

- Don't always save the difference
  - Example: 28 watt lamp saves only about 2 to 2.5 watts compared to standard 32 watt lamp, not 4 watts
    - Per Stan Walerczyk ([www.lightingwizards.com](http://www.lightingwizards.com))
- Have shorter lamp life than high performance full 32-w T8s
- Can't be used with dimming ballasts, some rapid-start and programmed-start ballasts
- Can't be used below 60° F
  - Same problems as ES T12 (34-w) lamps
    - Flickering, phosphor trails, low light output
- Some lamps can't be used with occupancy sensors on some existing ballasts



# ENERGY SAVING 25, 28 & 30W F32T8s

- Management challenge:
  - Who is going to keep straight which type of T8s go where?
  - Ex: conference rooms with dimming ballasts, exterior applications and hi-bays
- Utility programs usually do not provide incentives for ES T8 lamps
  - Long term savings not permanent
  - Facility people can buy much less expensive basic grade 32-watt lamps as replacements later
  - Some ES lamps cost between \$3 and \$4



# High Performance T8 Systems

## “Super T8”

- Combination:
  - high-lumen, extended life lamps
  - low BF, reduced wattage electronic ballast
- 15-20% more efficient than standard T8 systems
- Savings up to 40% when replacing 34-w T12 systems
- Identification:
  - lamps with initial lumen ratings starting at 3100 lumens
  - high lumen maintenance > 90% (“barrier coat” technology)
- Lamp manufacturers:
  - Philips – “Advantage”
  - GE – “HL”
  - Sylvania – “Xtreme”
- Ballast manufacturers:
  - Advance – “Optanium”
  - GE – “Ultramax”
  - Sylvania – “Xtreme”
  - Universal – “HE”



# Comparison of T8 & Super T8 Systems



Description	Initial Lumens	Ballast Factor (BF)	Lamp Life (hrs)	System Watts
Standard F32T8 e/w electronic ballast	2,850	0.88	20,000	1-lp 30-w 2-lp 58-w 3-lp 87-w 4-lp 114-w
Super F32T8 e/w reduced-power electronic ballast	3,200	0.78	24,000	1-lp 25-w 2-lp 48-w 3-lp 73-w 4-lp 96-w

Source: Walerczyk LF 2002

# T5 Fluorescent Lamps

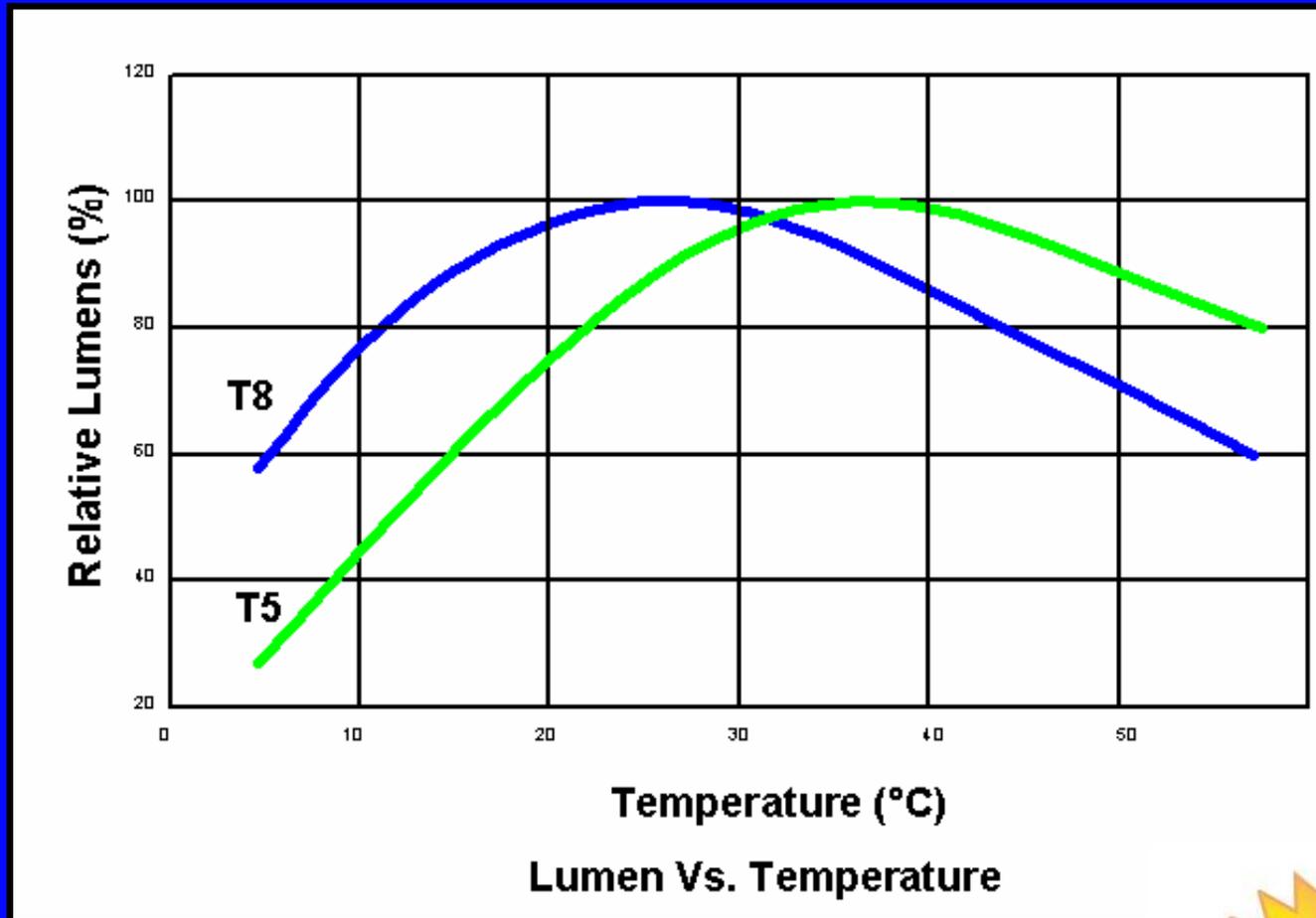


*Too bright for most low-ceiling direct applications*

*Most effective in cove and indirect applications*

- 5/8" dia lamp w/min bi-pin bases
- Millimeter lengths
  - *Not 2', 3', 4', etc*
  - *Not a retrofit lamp*
- Peak light output at 35C vs. 25C for T12, T8, etc
  - Increased fixture efficiency
- Operate on electronic ballasts
- Standard T5 – most efficient
- T5 HO – more lumens

# T5 & T8 Light Output vs. Temperature



Lumen Vs. Temperature

## 4' LINEAR FLUORESCENT EFFICACY TABLE

<i>4' lamp type</i>	<i>lamp lumens</i>	<i>lamp watts</i>	<i>lamp lumens per lamp watts</i>	<i>lamp quant</i>	<i>ballast type</i>	<i>ballast factor</i>	<i>system watts</i>	<i>initial system lumens</i>	<i>initial system lumens per watt</i>	<i>end of life lumen maintenance</i>	<i>end of life system lumens</i>	<i>end of life system lumens per watt</i>
high perform. F32T8	3100	32	96.9	2	EE IS	0.87	53	5394	101.8	92%	4962	93.6
F28T8	2750	28	98.2	2	EE IS	0.87	48	4785	99.7	92%	4402	91.7
25W F32T8	2400	25	96.0	2	EE IS	0.87	43	4176	97.1	92%	3842	89.3
30W F32T8	2850	30	95.0	2	EE IS	0.87	52	4959	95.4	92%	4562	87.7
F28T5	2900	28	103.6	2	PS	1.00	64	5800	90.6	94%	5452	85.2
basic grade F32T8	2800	32	87.5	2	EE IS	0.87	53	4872	91.9	90%	4385	82.7
F54T5HO	5000	54	92.6	2	PS	1.00	117	10000	85.5	93%	9300	79.5
F34T12 CW	2650	34	77.9	2	RS M	0.88	72	4664	64.8	78%	3638	50.5

notes: Lumens, lumen maintenance, ballast factors and wattages may vary among various manufacturers.

Although efficacy can be improved with IS and RS ballasts with T5s and T5HOs, lamp life can be greatly reduced and lamp manufacturers may not warranty the lamps.

93% is used as an average EOL lumen maintenance for T5HOs. 90% - 94% range among manufacturers.

All wattages based on 277V. EE IS is extra efficient instant start. PS is program start. RS M is rapid start magnetic.

Source: Stan Walerczyk



# EXTRA EFFICIENT BALLASTS

- Extra efficient ballasts consume 3 – 6 watts less than generic electronic ballasts (GEB), while providing the same amount of light
- Cost \$1 - \$4 more, saves \$20 - \$40 in electric cost over ballast life
  - About 15 years or 60,000 hour ballast life
- Most new fixtures come with GEBs
  - cost the least
- Some lighting management companies still using GEBs



# EXTRA EFFICIENT BALLASTS

- All major mfgs have extra efficient ballasts
  - IS ballasts
    - Advance Optanium IS
    - GE Ultramax
    - Howard Hex
    - Sylvania QHE
    - Universal ULTim8
  - Programmed-start ballasts
    - Advance Optanium PS
    - GE Ultrastart
      - Including 0.6 BF
      - About the same total watts as ES lamps with higher BF ballasts
    - Sylvania PSX



# Starting Method Comparison

**Instant Start**

**Rapid Start**

**Program Start**

**Cathode Voltage**

0V



4V



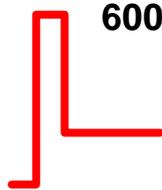
6V

3V

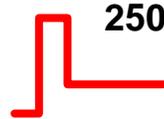


**Starting Voltage**

600V



250V



heating  
delay .....

600V



**Start Cycles**

Up to 20k

Up to 20k

Up to 50k+

**Start Temp**

0° F

50° F

0° F

**Input Power (2 Lamp)**

53-58W

63W

60W

**Wiring**

Parallel

Series

Series

**Lamp Life (3hrs/start)**

15-24K

20-24K

20-30K



# T5 2-Lamp Direct (RT-5)



- High performance, low glare
  - 71-w per fixture
  - 33% savings - from 3-lp T8
  - 60% savings - from 4-lp T8
- Uses std (hi-eff) T5 lamps
- Matching hi-eff ELB
  - Pentron system from OSI
- Hi/Lo (step dimming) control is optional
  - Doubles savings when low 50% of time

Source: Acuity Brands - Lithonia



# CERAMIC METAL HALIDE (CMH) LAMPS

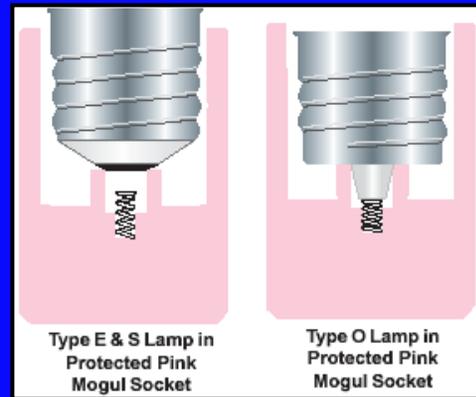
- Uses same ceramic arc tube as High-Pressure Sodium (HPS)
  - PolyCrystalline Aluminum (*PCA*)
- CMH have 2 electrodes and are started with a pulse starter
- Ceramic arc tube stabilizes color shift and improves lumen maintenance
- Also improves lamp efficacy (LPW)





# HIGH-WATTAGE CERAMIC METAL HALIDE LAMPS

- 320, 350, 400-w
  - ‘protected’ lamps
- Use same PCA arc tube as low-wattage CMH
- EX-39 base
  - Exclusionary base



# High-Wattage CMH

## Product Range – Philips Lighting

Watts	Initial Lumens	Packages	Avg Rated Life (hrs)	CCT	CRI	Lamp LPW
320	28,800	ED-28	20,000	4200K	90	90
350	31,500	ED-37	20,000	4200K	90	90
400	36,000	ED-28 ED-37	20,000	4200K	90	90

All models are protected lamps w/exclusionary bases



# High-Wattage CMH

## Product Range – Philips Lighting

### HPS-Retro White™

Watts	Initial Lumens	Packages	Avg Rated Life (hrs)	CCT	CRI	Lamp LPW
250	20,500	ED-18*	20,000	4000K	90	82
400	34,800	ED-18*	20,000	4000K	90	87



\*Both models operate on HPS ballasts



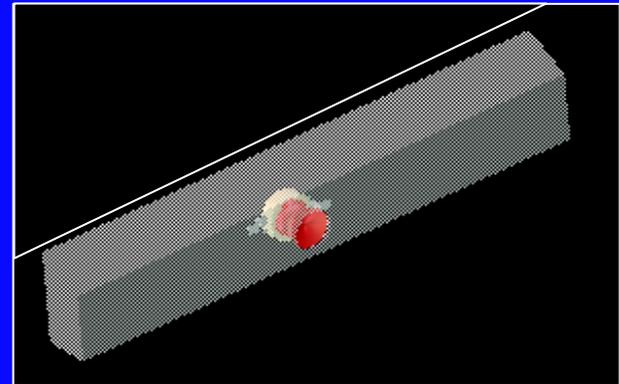
# LED LIGHTING

- New, high brightness LEDs showing up in speciality lighting products
  - Exit signs
  - Portable way-finding signs



# Edge Lit Exit Sign

- Single LED Exit Sign
  - 1 Red Side-Emitting Power LED
    - 1-watt
  - Excellent coupling into acrylic with a single blind or through hole



# LED LIGHTING



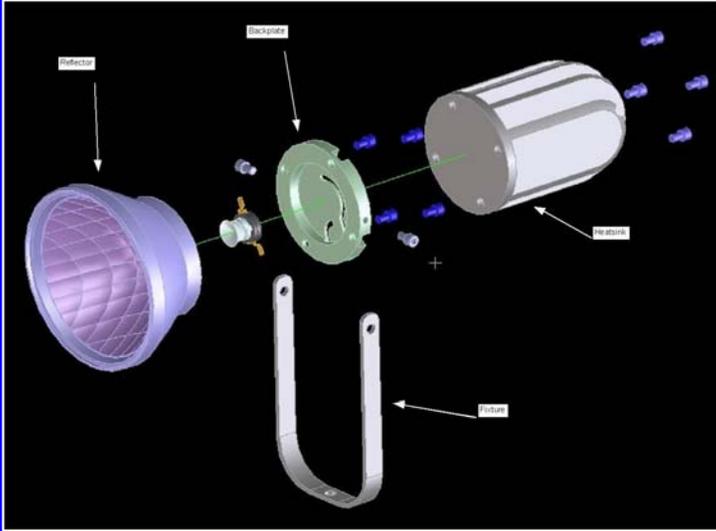
- New, high brightness LEDs showing up in speciality lighting products
  - Way-finding applications
    - Theatre step lighting



[www.tempointustries.com](http://www.tempointustries.com)

[www.gvalighting.com](http://www.gvalighting.com)

# MR16 Replacement



- Reflector based MR16
  - One 5-w side-emitting LED
  - Output same as 10-w halogen

# Mini Spot / Accent Lamp

- Four 5-w white LEDs
- Produce ~ 400 lumens
- Simple reflector optics to direct light forward



# LED LIGHTING

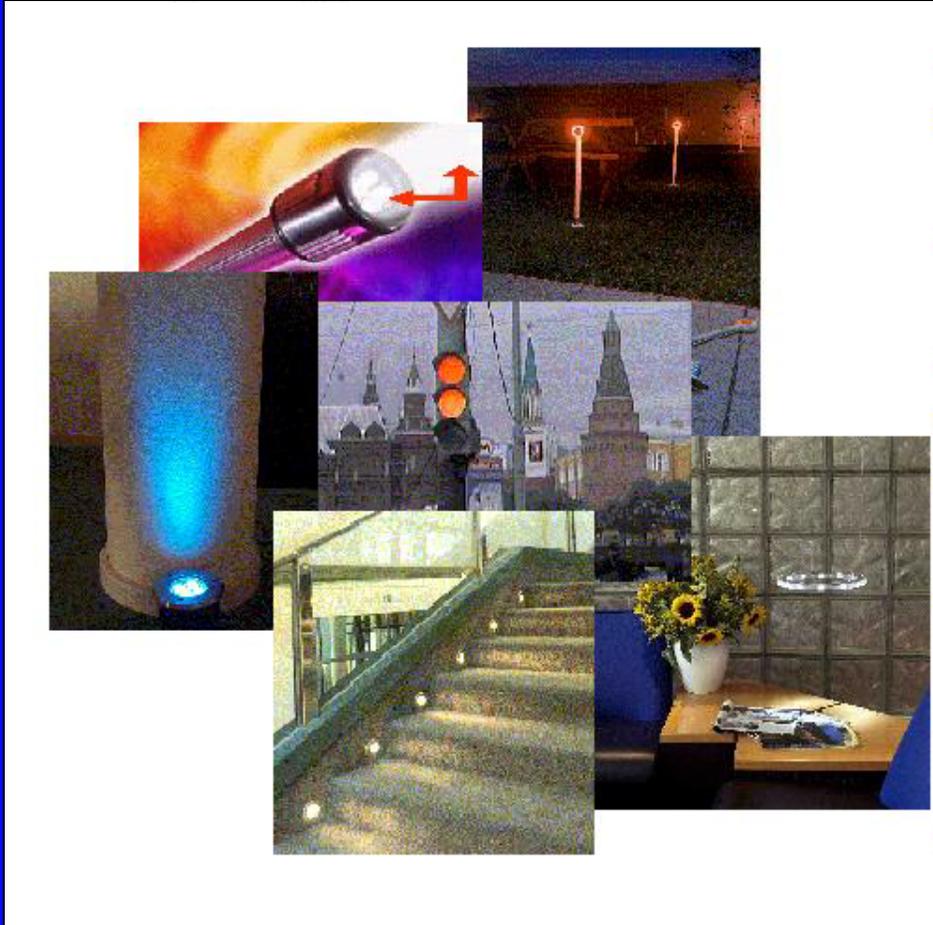
- New, high brightness LEDs showing up in speciality lighting products
  - Way-finding applications
    - Drop-in retrofit avail
      - For JB mtd incand
      - Used in some aisle seats
      - Operates on 90-240 vac or LV (12-24 vac or vdc)
      - 6 colors (incl cool wh & wm wh)
      - 5 yr warranty
      - < \$40



[www.permlight.com/products/enbryten/retrofit/](http://www.permlight.com/products/enbryten/retrofit/)



# LED Applications Enabled Today



- Traffic / Railway / Marine / Airport Runway Signaling
- Automotive Exterior / Stop-Tail-Turn / CHIMSL / EVL
- Signage / Corporate Identity
- Portable Lighting / Flashlights
- Low Lumen Accent / Reading / Map / Task Lights
- Stair / Step / Orientation Lighting
- Fiber Optic Alternative
- Landscape Lighting / Bollards
- Architectural Detail / Column / Wall Wash / Cove Lighting
- LCD Back Lighting / Edge-Lit Signs / Point Of Sale

# Airfield and TV/Radio Tower Beacon



# Obstruction & Strobe Lights



# Illumination in the Future?

Fast forward.....25 years



What's a light bulb and why would anyone want to change one?



**for more information**

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