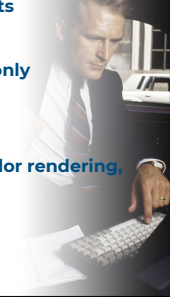


FLUORESCENT RETROFITS

Existing System: T12 lamps with magnetic ballasts

Retrofit Alternatives:

1. T12 low wattage lamps (34W) – replace lamps only
 - Less light, less energy consumption
2. T8 (32W) – replace lamps and ballasts
 - Same light, less energy consumption, better color rendering, less lamp flicker, less ballast hum
 - Can operate 4 lamps per ballast
 - Can be tandem wired
 - Electronic ballasts can be parallel wired



FLUORESCENT RETROFITS +

3. T10 (42W) – replace lamps only
 - More light, same energy consumption
4. T10 (42W) – replace lamps and ballasts
 - Much more light, same energy consumption, same benefits as T8's
5. T5 (28W) – replace lamps and ballasts
 - Same light, less energy consumption than T8's
6. New 28W and 30W T8's now available
 - Super T8s with 3100 lumens (32W)
7. New 25,000 and 30,000 hour life lamps available, with use of programmable start ballasts matched to lamp



NEW LIGHTING TECHNOLOGY

- ☑ Induction lamp
 - ➡ Long life -- 100,000 hours for lamp & ballast
 - ➡ Phillips QL lamps in 55W, 85W and 165W
 - ➡ New application with reflector to replace metal halides as sign lights for road and commercial signs. Last four times as long
 - ➡ OSRAM/Sylvania is the other maker of long life induction lamps



LED LIGHTING

- ☑ 80% of all new exit lights are LED lights
- ☑ But, there are some other interesting applications
 - ➔ Traffic Signals
 - Green 30 cm ball 140 W to 13 W LED
 - Red 30 cm ball 140 W to 11 W LED
 - Life 1 year to 7 years for LED
 - Cost \$3 to \$75 for LED
 - ➔ Commercial Advertising Signs (Neon)
 - Neon 15 mm tube 9 W/metre
 - LED 15 mm replacement 3.1 W/metre



T5 / HO AND HIGH BAYS

- ☑ High Bay & Fluorescent T5/HO (it's not just for HID anymore!)

Lamp and Ballast *

Lamp	Maintained Light	Wattage
4 - T5/HO Lamps	19,000 Lumens	242 watts
1 - MVR250/U	13,500	293
1 - MVR250/Pulse	17,000	288
6 - T5/HO Lamps	28,500 Lumens	363 watts
1 - MVR400/U	23,500	458
1 - MVR400/Pulse	33,000	456

* (Impact of Fixture Design on Performance NOT included)



COMPARE LIGHTING POWER DENSITY TO ASHRAE/IES 90.1 VALUES

Example Whole Building Lighting Power Densities (W/m²)

	1989	1999	2003
Offices	17.54	13.99	10.76
Education	19.26	16.14	12.91
Retail	25.40	20.44	16.14
Warehouse	5.70	12.91	8.61



TYPICAL LIGHTING OPERATION

Building Type	Annual Hours of Operation
Assembly	2760
Avg. Non-Residential	3500
Education	2605
Food Sales	5200
Food Service	4580
Health Care	7630
Lodging	8025
Mercantile	3325
Office	2730
Warehouse	3295



BEYOND
SMART CITIES

THANK YOU



THE WORLD'S 1ST GREEN TECHNOLOGY
MARKETPLACE
