

Lighting Technology – Specific Lighting Technology Session



This Activity received funding from the Department of Industry as part of the Energy Efficiency Information Grants Program.

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Lighting – Specific Technology Session

Session Content

Energy Efficient Lighting Upgrade Options

- General lighting service lamps
- Down lights
- Linear fluorescent lights
- HID lamps (high bays, low bays and flood lights)

Lighting Controls

- Switching
- Occupancy sensors
- Photo sensors

Context: Lighting design and product considerations

- Good lighting design is often the most overlooked aspect of lighting efficiency, and vice versa.
- A lighting installation cannot be efficient AND attractive, without careful consideration of ALL the aspects of lighting design. This includes choice of lamp, control gear and luminaire, along with luminaire placement, use of day lighting and intelligent control such as motion detectors and automatic dimming.
- Much of the information provided today on the details of the technology are sourced from product specifications. The elements discussed are the important things that you should look for in any replacement product, and may vary to the specifications provided.

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General Lighting Service (GLS) CFLs

Designed to replace existing incandescent GLS lamps with lamp power from 40-100 Watts. Available for Edison screw and bayonet cap fittings.

| Technology Details | |
|---|---|
| Lamp power: | 5-23 Watts |
| Rated lamp life: | 8,000-12,000 hours |
| Colour temperature: | 3000K (warm white)-6000K (daylight blue) |
| Colour rendering index: | 80+ |
| Luminous flux (light output): | 600-1450 lumens |
| Lamp lumen maintenance factor: | ~0.70 at end of rated lamp life |
| Indicative price: | \$5-\$10* |
| Electrical contractor required for installation | No |



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General Lighting Service (GLS) LEDs

Designed to replace existing incandescent or CFL GLS lamps with lamp power from 13-60 Watts. Available for Edison screw and bayonet cap fittings.

| Technology Details | |
|---|---|
| Lamp power: | 5-17 Watts |
| Rated lamp life: | 15,000-40,000 hours |
| Colour temperature: | 3000K (warm white)-6000K (daylight blue) |
| Colour rendering index: | 75+ |
| Luminous flux (light output): | 340-1055 lumens |
| Lamp lumen maintenance factor: | ~0.70 at end of rated lamp life |
| Indicative price: | \$20-\$50.00 |
| Electrical contractor required for installation | No |



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LED Replacements for Halogen Down Lights

Designed to replace existing halogen 12 and 240 volt down lights with lamp power from 10-55 Watts.

Available for GU10 (220-240V) and GU5.3 (12V) bases, high quality lamps are generally dimmable. Can be fitted with new luminaire or retrofitted into existing luminaire.

| Technology Details | |
|---|--|
| Lamp power: | 3-16Watts |
| Rated lamp life: | 35,000-70,000 hours |
| Colour temperature: | 3000K (warm white)-4000K (cool white) |
| Colour rendering index: | 80+ |
| Luminous flux (light output): | Up to 955 lumens |
| Lamp lumen maintenance factor: | ~0.70 at end of rated lamp life |
| Indicative price: | \$20-\$60.00 depending on lamp power* |
| Electrical contractor required for installation | No for retrofit. Yes for fitting of new luminaire. |



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T5s + Adaptors to Replace T8 Linear Fluorescent Lamps

- T5 adaptors enable the installation of T5 fluorescent tubes into T8 fixtures without any changes to the fixture itself offering an energy saving of ~30% whilst delivering comparable light output.
- Adaptors and tubes are available to replace 18, 36 and 58W T8 tubes.

| Technology Details | |
|---|--------------------------------------|
| Lamp power: | 14-35 Watts |
| Rated lamp life: | 25,000 hours |
| Colour temperature: | 4000K (cool white)-6500K (day light) |
| Colour rendering index: | 85 |
| Luminous flux (light output): | 1050 (14W)-2870 (35W)lumens |
| Lamp lumen maintenance factor: | 90% at 20,000 hours |
| Indicative price: | \$15-20 |
| Electrical contractor required for installation | No |



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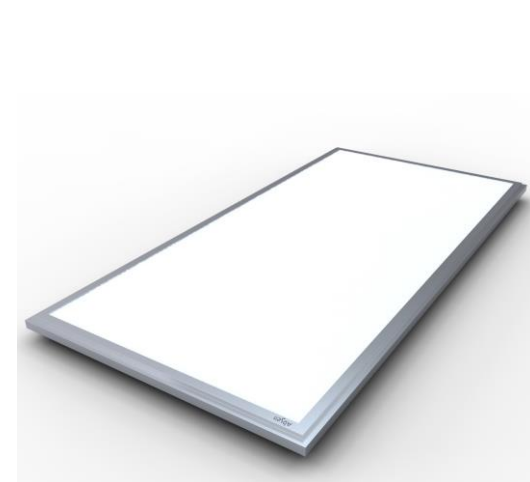
LED Replacements for T8 Linear Fluorescent (tube) Lamps

Marketed to replace existing linear fluorescent lamps with lamp power from 18-58 Watts.

Important Considerations-Caveat Emptor!

- QUALITY
- FIT FOR PURPOSE
- SAFETY

Refer to ERAC Information Bulletin Nov 2011, 'Safety of T8 Lamp Replacement Tubes and Modified Luminaires' for further details.



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LED Replacements for Linear Fluorescent (tube) Lamps (cont.)

| Technology Details | |
|---|--|
| Lamp power: | 9-23 Watts |
| Rated lamp life: | 35,000-45,000 hours |
| Colour temperature: | 3000K (warm white)-6000K (cool white) |
| Colour rendering index: | 70+ |
| Luminous flux (light output): | Up to 2100 lumens |
| Lamp lumen maintenance factor: | ~0.70 at end of rated lamp life |
| Indicative price: | \$40.00* |
| Electrical contractor required for installation | If existing luminaire control gear incorporates iron core ballast, tube and starter can be replaced without requiring an electrical contractor. Not recommended for retrofitting luminaires with control gear incorporating electronic ballasts. |



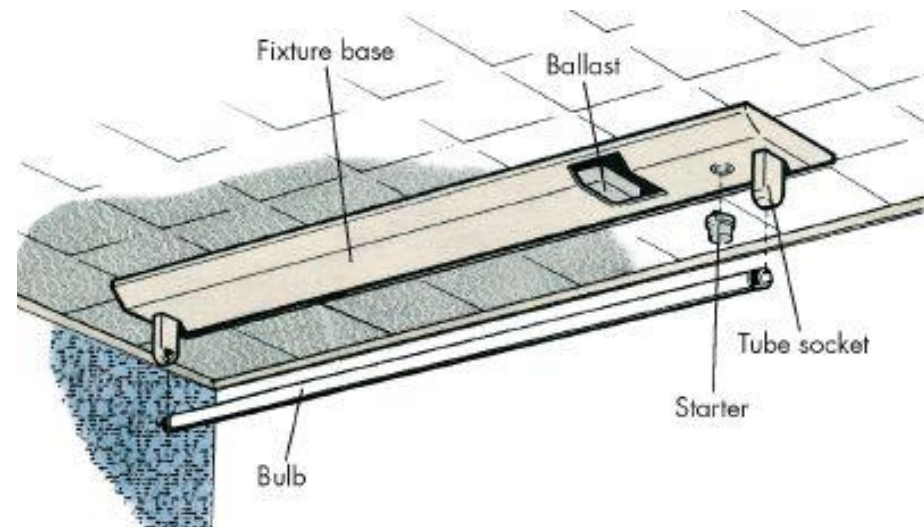
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LED Replacements for Linear Fluorescent (tube) Lamps (cont.)

How do you know if your current luminaire incorporates iron core ballasted control gear?

Iron core ballasted fluorescent luminaires require separate starters (as shown in the images to the right).

If your luminaire requires a separate starter, the control gear incorporates an iron core ballast. It is therefore suitable to retrofit an LED tube into this luminaire and replace the existing starter with the LED specific starter provided by the LED tube supplier.



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LED Replacements for High Intensity Discharge (HID) Lamps

High Bays

- LED high bay luminaires may be suitable to replace existing mercury vapour (MV), metal halide (MH) and high pressure sodium (HPS) high bay luminaires.
- 150W-180W LED high bays with high quality luminaires may be suitable to replace 400W MV, MH and HPS high bays.

| Technology Details | |
|---|--|
| Lamp power: | 80-250+Watts |
| Rated lamp life: | 70,000+ hours |
| Colour temperature: | 4000K (cool white)-6000K (daylight) |
| Colour rendering index: | 75+ |
| Luminous flux (light output): | 7,200 to >21,000 lumens |
| Lamp lumen maintenance factor: | ~0.70 at end of rated lamp life |
| Indicative price | \$450-\$1,000* depending on lamp power |
| Electrical contractor required for installation | Yes for fitting of new luminaire. |



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Pulse-start Metal Halide HID Metal Halide High Bays

- 320 Watt pulse-start metal halide high bays offer a simple low cost efficiency opportunity in replacing existing 400 Watt metal halide high bay luminaires.

| Technology Details | |
|---|-----------------------------------|
| Lamp power: | 320Watts |
| Rated lamp life: | 30,000 hours |
| Colour temperature: | 4000K (cool white) |
| Colour rendering index: | 68 |
| Luminous flux (light output): | ~31,000 lumens |
| Lamp lumen maintenance factor: | 86% at 8,000 hours |
| Indicative price: | \$200 |
| Electrical contractor required for installation | Yes for fitting of new luminaire. |



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LED Replacements for High Intensity Discharge (HID) Lamps

Low Bays

LED low bay luminaires are designed to replace existing mercury vapour (MV), metal halide (MH) and high pressure sodium (HPS) low bay luminaires. 150W LED low bays with high quality luminaires can replace 400W MV low bays.

| Technology Details | |
|---|---------------------------------------|
| Lamp power: | 90-270Watts |
| Rated lamp life: | 50,000+ hours |
| Colour temperature: | ~5000K (cool white) |
| Colour rendering index: | 70+ |
| Luminous flux (light output): | 8,100 to >24,000 lumens |
| Lamp lumen maintenance factor: | ~0.70 at end of rated lamp life |
| Indicative price: | \$400-\$1,000 depending on lamp power |
| Electrical contractor required for installation | Yes for fitting of new luminaire. |



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LED Replacements for Halogen Floodlights

Floodlights

- LED floodlights may be suitable to replace existing halogen luminaires.
- A 30W LED floodlight will offer comparable light output to a 150W halogen floodlight, though MH floodlights

| Technology Details | |
|---|---|
| Lamp power: | Up to 1000 Watts |
| Rated lamp life: | 50,000+ hours |
| Colour temperature: | ~2700K (warm white)-7000K (cool daylight) |
| Colour rendering index: | 80+ |
| Luminous flux (light output): | ~400 to ~55,000 lumens |
| Lamp lumen maintenance factor: | ~0.70 at end of rated lamp life |
| Indicative price: | \$100-\$4,000 depending on lamp power |
| Electrical contractor required for installation | Yes for fitting of new luminaire. |



Lighting Technology – Lighting Controls

Switching

- Make it as easy as possible for people to turn off lighting that is not required.
- Use clear signage to instruct actions.

Occupancy Sensors using Passive Infrared (PIR) or Ultrasonic Sensors

- Motion sensors - suitable to use in indoor and outdoor locations where people will move through the detection zone, require relatively large movements to trigger .
- Presence sensors have increased sensitivity and are able to register very slight movements (a seated persons head or hand movements). Presence detectors are used indoors where people are usually seated (offices).

Photo Cell Sensors

- Sense the amount of daylight present in an area and dim artificial lighting to maintain a programmed lux (light) level.
- Used in spaces with good natural light.



What Next?

- Next webinar: Implementation, funding and subsidies
- Call VECCI's Carbon Compass Helpline on **8662 5490** for advice on lighting upgrade considerations, different technologies and subsidies available.
- www.carboncompass.com.au
- www.whatcanidorightnow.com.au



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Lighting Technology – References and Further Reading

Further Information and Resources

- The Basics of Efficient Lighting-A reference manual for training in efficient lighting principles 2009, Dept. of Environment, Water, Heritage and the Arts
<http://www.energyrating.gov.au/wp-content/uploads/2011/02/2009-ref-manual-lighting.pdf>
- Light's Labour's Lost-Policies for energy-efficient lighting, International Energy Agency
<http://www.iea.org/publications/freepublications/publication/name,3644,en.html>
- Energy efficient lighting-Technology report, NSW Office of Environment and Heritage
<http://www.environment.nsw.gov.au/sustainbus/energyefflight.htm>

Lighting Standards

- AS1680.1-2006, 'Interior and workplace lighting - general principles and recommendations'
- AS/NZS 1680.2 series, 'Interior and workplace lighting - specific applications'