

TECHNOLOGY PROFILES

Lighting - High Efficiency Fluorescent



Technology Group: Lighting

Description: For decades linear fluorescent lighting has been the standard technology used to provide general lighting in commercial, institutional, and industrial applications. Newer lamps are narrower, more energy-efficient, and show colors more accurately. However, a great many fixtures in federal facilities still use older, less efficient lamps, creating an opportunity for low-risk, predictable energy savings.

Lamps are generally identified by a code containing a letter and a number, such as T-8. The "T" stands for tubular shape, and the number indicates the lamp's diameter in eighths of an inch. High efficiency lamps include the T-10, T-8, and T-5. When operated with an electronic ballast, the noise and flicker associated with the old magnetic ballast technology is eliminated.

These new lamps are more energy efficient, as measured in lumens (lm) of light per watt of power, than conventional T-12 lamps. Standard incandescent lamps produce about 19 lm/watt; traditional T-12 lamps with magnetic ballasts produce about 65 lm/watt, while the new fluorescent lamps with electronic ballasts provide in the range of 90 lm/watt.

In addition to more light output, these thinner lamps block less of the light reflecting off the back of the light fixture. The new lamps also have greatly improved color rendering indexes (CRI), with a CRI above 70 being good. The higher CRIs allow the lamps to be used where accurate color rendition is important, and allow office workers to see better with less light. These lamps are also available in color temperatures ranging from cool to warm light, a great improvement over the harsh lighting of older fluorescent lamps.

Applications: The new lamps are useful for the same applications as the old, including most spaces in commercial, institutional, and industrial facilities that have fixtures less than 12 feet above the floor.

T-10 lamps, rated at 40 watts, are 4' long and are commonly used to retrofit T-12 systems, using the same fixture and ballast, but producing 20% more light. This feature makes them useful in previously under-lit spaces or to increase light levels after reducing the number of lamps in operation.

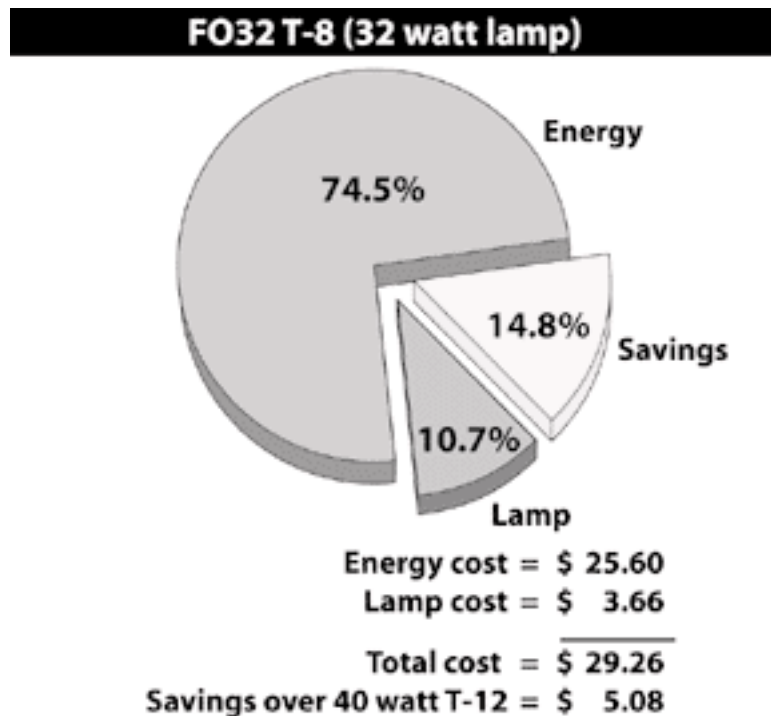
T-8 lamps are rated at 32 watts, and when combined with electronic ballasts they produce about 95 lumens per watt. They are becoming the standard for new construction and retrofits because of low installation cost. Three lamps in fixtures spaced 8 to 10 feet apart provide a very uniform lighting pattern, with light levels adequate for most office tasks. With three-lamp fixtures, the center lamp is often switched separately from the outer two lamps, providing an economical way to achieve the option of three light levels. A dimming control system may also be considered, adding the capability of compensating for daylighting and lamp lumen depreciation (see the Technology Profiles on these subjects).

T-5 lamps, rated at 28 watts, are becoming popular in Europe and are finding increasing use in the U. S. for new construction. They are not a retrofit option—at 5/8" diameter and 45" long, these lamps require different mounting brackets in the fixture than other fluorescent lamps. However, they may fit where others do not, and are popular for cove lighting and display cases as well as general lighting. They are also brighter than the T-8.

Performance/Costs: Electricity accounts for about 88% of the total annual cost of a lighting system, so a higher efficiency lighting system, even one with a higher first cost, may quickly pay for itself with energy savings.

Lamp costs account for only about 4% of a system's cost. A T-8 lamp costs \$2-3 and a T-5 lamp about \$7. Electronic ballasts cost about \$20. New fixtures add to the cost, but good fixtures are much more efficient than older models and often save on the number of lamps required. The lower power consumption of the T-8 and T-5 makes it easier to meet lighting power allowances specified by energy codes. Because of the energy savings, they are popular as retrofits as well. The graph below illustrates the energy savings of a T-8 versus a T-12 lamp.

When used as a retrofit, new ballasts must often be installed since T-8 and T-5 lamps must be paired with electronic ballasts. In some fixtures, the tombstones (the rounded plastic pieces that the pins on the ends of the lamps slip into) need to be replaced as well. Recent studies suggest that improved lighting quality increases productivity.



Availability: High efficiency lamps are readily available from lighting distributors nationwide. T-8 lamps are available in 2, 3, 4, 5 and 8-foot lengths, as well as U-bent tubes, so they will fit a wide variety of fixtures. A high-output (HO) version is available in 8-foot models. T-5 lamps are also available in a high-output (HO) model.

For Additional Information:

Lighting Upgrade Manual

From the EPA Green Lights Program. A practical reference tool for the lighting upgrade process.
<http://www.epa.gov/buildings/esbhome/tools/manuals.html>

Buying Energy Efficient Products

A resource from DOE's Federal Energy Management Program (FEMP) covers information on energy efficient federal procurement and product energy efficiency recommendations, including Fluorescent Tube Lamps and Ballasts.

<http://www.eren.doe.gov/femp/procurement/>

lightsearch.com

Directory to companies, products and resources for lighting specifiers and buyers.

<http://www.lightsearch.com>

Guide to Fluorescent Lamp-Ballast Compatibility

The Lighting Research Center guide that compares T12 to T8 lamp ballasts.

<http://www.lrc.rpi.edu/Projects/lamp.html>

NW Energy Efficient Electronic Ballasts

Searchable database of ballasts for full-size fluorescent lamps.

<http://data.northwestlighting.com/nwdata/ballastlocator.htm>

Energy Efficient Ballast Lists.

Ballasts that meet specifications of the Lighting Design Lab Specification Committee, the Fluorescent Lamp Electronic Ballast Specifications, and ANSI C82.11-1993. See "Lighting Information Documents" for lists of T5 and T8 ballasts.

<http://northwestlighting.com/downloads/index.html>

T12 to T8 Retrofits

A factsheet published by the Lighting Design Lab.

<ftp://public:download@ftp.irisinc.com/lighting/t12t8.pdf>

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