

Understanding LED Tubes and Retrofit Options

One of the greatest opportunities to recognize energy efficiency and associated cost savings for you and your business is the conversion of existing fluorescent fixtures to LED. This can be accomplished quite economically by keeping your existing fixtures and simply replacing the fluorescent tubes. With significant recognized savings in both energy and maintenance costs, LED tubes offer a significant opportunity to improve not only your bottom line but improve your working environment as well.

Fluorescent tubes require ballasts in part because they require a high start-up voltage - which the ballast provides - to overcome initial resistance. The ballast then adjusts to carefully regulate the electrical power delivered to the tube. Since LEDs do not require either the high start up voltage or power regulation, the ballast is not required. Generally, there are two types of types of LED tubes replacements available on the market:

Ballast Compatible (UL Type A) – Require an electronic ballast to drive the LED tube.

Direct Line Voltage (UL Type B) – Require the fixture to be rewired to remove the ballast and operate on direct AC line voltage

LED Tube Benefits

- No Mercury or other hazardous materials
- Greater longevity & durability
- More efficient
- Dimmable
- Better cold-weather performance
- 100% recyclable
- Low Heat
- Low non-visible light emissions



Ballast Bypass Benefits

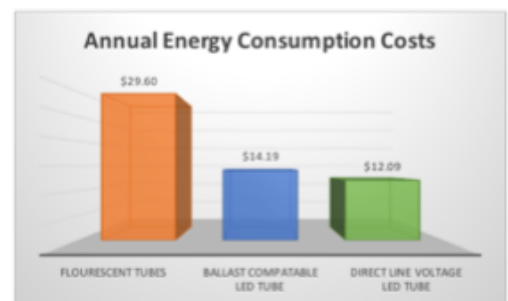
- No Buzz/Hum
- No cost difference to ballast compatible units
- No ballast compatibility issues
- Life expectancy is based on the tube rather than other components
- Greater cost savings

Annual Cost Comparison Between Tube Types

It is important to not only consider the capital outlay for an LED replacement program but to consider the total cost of ownership over the life expectancy for the various options as well. One of the most common considerations is whether to bypass the existing ballast or not (magnetic ballasts need to replace with an electronic ballast or bypass entirely).

Triad evaluations have determined that, in the majority of customer applications, the bypassing of ballasts offered significantly better savings in both energy consumption and maintenance requirements than did leaving the ballast in place. Just because the initial capital costs may be less expensive does not mean it is a better total lifecycle solution

Standard two-tube fixture



Annual Expected Maintenance Costs (Over Life Span of LED Tubes)



Triad T8 Tubes offer a distinct competitive advantage – they work both with and without electronic ballasts, in voltages from 100 to 347VAC!



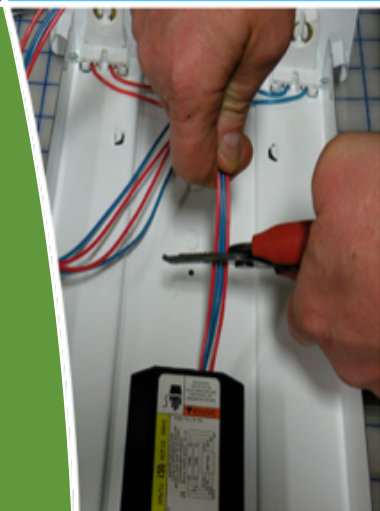
Ballast Compatible vs Direct Line Voltage

Ballast Compatible (UL Type A):

- Are "Plug and Play", easy to install and do not need an electrician to do (only if ballasts are already a compatible electronic model, not magnetic)
- Each tube type/manufacture needs to be tested with each type of ballast. There is no "universal fit" LED tube available.
- Manufacturer warranties do not cover tube failures caused by tube/ballast incompatibility. This can lead to overheating and fire concerns.
- All ballasts consume additional electricity during operation and must be replaced periodically

Direct Line Voltage Mounting (UL Type B):

- More energy efficient and further reduces maintenance costs over the life cycle to near \$0 annually
- Requires the services of an electrician to remove or bypass the ballast
- Re-certification of the fixture type is strongly recommended. Re-certification involves an onsite electrical inspection and approval by a representative from one of the certification agencies (CSA, UL, Intertek, etc.) who ensures that the retrofit meets CSA22.2 requirements.
- Tombstones or lamp holders are considered "live voltage" and do pose a safety consideration, particularly with higher line voltages (277, 347VAC). Triad provides clear warning labels for affixing to all modified fixtures to communicate fixture status and warnings.



Quality Considerations

It is quite easy to find cheap tube replacements, constructed of lower quality materials, offering a shorter life expectancy with a more limiting warranty and often not certified to North American safety standards. But are you really saving anything? With over 19,000 factories in China alone producing LED related products it can be difficult to ensure you are receiving a quality product that will provide the reliability and safety you expect.

Triad has, unfortunately, come across many installations where "more economical" tubes were installed only to realize failures including dried out drivers, bent tubes (plastic) falling out of holders, yellowing lenses and melted connectors. Make sure you understand what you are truly getting!

*Triad tubes are constructed of aluminum bodies with acrylic lens (optionally all-glass bodies), **NOT PLASTIC**, utilize an 80,000 hour rated Rubycon integrated driver and come with an **UNCONDITIONAL 5-year warranty!***

QUALITY • RELIABILITY • PERFORMANCE



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