

The ABCs of LED Tubes (UL Type)

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Object of the White Paper

This white paper will show:

- Differences between UL Type A, B, and C LED Tubes
- Operations and maintenance considerations
- Installation cost/benefit

As a rapidly growing lighting technology, LED linear tube options are raising questions throughout the industry—it's important to know the options and which one will work best for you. When considering LED Tube refits, it is also important to understand the financial aspects as well as the installation, operations, and maintenance implications with three different options, which are UL Type A, UL Type B, and UL Type C

TYPE A Easiest Installation

LED Tube with Integrated Driver - Compatible and Operated on Existing LFL Ballast

Description: The UL Type A tube is designed with an internal driver that allows the tube to operate directly from the existing linear fluorescent ballast. Most of these products are designed to work with T12, T8 and T5 ballasts.

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Advantages: UL Type A offers the simplest installation process— retrofitting involves a simple swap of the existing LFL with a UL Type A LED tube. Unlike the other options, no electrical or structural modification of the existing LFL fixture is required.

Disadvantages: However, with these benefits come some limitations. The lifetime of a UL Type A solution is dependent not only on the design life of the LED tube, but on the linear fluorescent ballast life, which could result in additional maintenance and costs within the lifetime of the product. Ballast compatibility will vary by manufacturer and must be checked prior to install.

Additionally, a UL Type A tube sacrifices efficiency due to the additional power loss from the existing ballast and is limited in dimming and controllability.

TYPE B Simplest total System

Ballast Bypass LED Tube - Wired to Mains

Description: Like the UL Type A, this UL Type B tube operates with an internal driver. However, UL Type B's internal driver is instead powered directly from the main voltage supplied to the existing LFL fixture, requiring several important and unique considerations. Some Type B systems requires an in-line fuse.

Advantages: UL Type B offers the simplest total system— retrofitting involves wiring directly to main voltage, bypassing the ballast, which removes any compatibility issues, as well as eliminating maintenance costs associated with ballast replacements.

Disadvantages: Installation of a UL Type B involves electrical modification to the existing fixture in order to connect the tube to the power supply. The existing LFL and its corresponding ballast must be removed from the fixture. Sockets should be replaced. (Many manufacturers require replacing with unshunted sockets.)

UL Type B is more efficient than UL Type A, with no power loss as a result of removing the existing LFL ballast, but similarly lacks control capabilities.

It is important to note that the fixture's incoming power wires are connected directly to the sockets, meaning installers are potentially exposed to the main's voltage during installation. For replacement safety reasons, strict adherence to installation instructions is critical when rewiring existing fixtures and utilizing UL Type B tubes. Safe installation can be completed, but total installation time and cost will increase because of additional precautions required.

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Top Misconceptions for Type B Solutions

“But once I convert to Type B, I will never have to replace a ballast again.”

True, the external ballast will have been removed. However, the electrical conversion from mains voltage to the LEDs still needs to be done. With Type B, this is done entirely within the Tube itself. In order to accomplish this, Type B Tubes require much more complex internal circuitry than Type A and Type C. As such, there are more components to potentially fail. This may result in higher incidence of lamp replacement.

“But isn’t all of that circuitry in the ballast or driver?”

Essentially, yes. But an external ballast or driver allows for a less challenging thermal environment for the electronics, due to the availability of space, remote placement of the device, and ability to use potting as required. Inside a lamp, like a Type B tube, the electronics are confined to a small space, near additional sources of heat (the LEDs), often within an additional enclosed reflective fixture. Also, Type B applications are more susceptible to damage or failure from transient voltages/power surges, whereas an external driver or ballast has a robust design that offers more protection. These factors need to be considered in regard to overall reliability of a very long-life lamp.

TYPE C – Best Performance

Description: A UL Type C tube, offered among GE’s Refit Solutions as the LED Tube with remote driver, operates with a remote driver that powers the LED linear tube, rather than an integrated driver. Like UL Type B, UL Type C involves electrical modification to the existing fixture, but the low-voltage outputs of the driver are connected to the sockets instead of line voltage.

Advantages: Installation for UL Type C tubes involves removing existing tubes and ballasts, and it may involve replacement of existing sockets, if damaged. The fixture input wires must be connected to the LED driver, and the driver’s low-voltage output wires must then be connected to the sockets before installing the new LED linear tubes. Once installed, this driver can power several LED tubes throughout the fixture.

The UL Type C offers excellent system efficacy, best system compatibility and greatest overall performance. It can be integrated with robust dimming and control functionality, helping to offset moderate labor and installation costs with heightened efficiency well into the future.

UL Considerations

If retrofitting an existing fixture that is UL approved with a UL-approved LED tube, the fixture will remain UL approved. If retrofitting an existing fixture that is not UL approved with a UL-approved LED tube, the fixture with the LED tubes would need to be submitted to UL for approval, if UL certification is necessary.

As a more controllable technology than LFL, LED lighting can be successfully integrated into facilities' energy-efficiency planning. And with new LED tube options, the installation work can be done without as much hassle.

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