RedBird LED

Why Redbird Stripit Kit® and Why Now, 7-8-2019 JAE

CONCLUSION:

For all the reasons listed herein, the RedBird LED Stripit Kit® product is clearly the best choice for an LED Retrofit upgrade to any fluorescent tube fixture. In addition to all of the functional, design and performance features, which make the Stripit Kit Best-in-Class, there are also the facts that they are 100% Made-in-America, BAA compliant, have an unlimited ten year full replacement warranty and >100,000 hour lifetime rating.

Economic Viability of LED Retrofit replacements for T8 or T12 Fluorescent Tubes.

Various LED upgrades for fluorescent have become a viable option for cutting power and maintenance requirements within the past 7 years. LED efficacy has been steadily increasing (today's best commercially available systems are operating at > 200 lumens/watt), costs are dropping, and system lifetimes can now exceed 10 years of continuous operation. The combination of these advances allows the total costs of installation to be easily recovered in a short time through energy savings alone. Adding in the reduction in maintenance costs due to the longer life span of LEDs makes switching to LEDs even more attractive. It is no surprise that the Compound Annual Growth Rate (CAGR) of the global LED market is exceeding 13-15%.

What LED Retrofit is best for upgrading 4' fluorescent tube fixtures? Comparing LED Tube Lights (TLEDs) with the RedBird LED Stripit Kit® Solution.

TLED BACKGROUND:

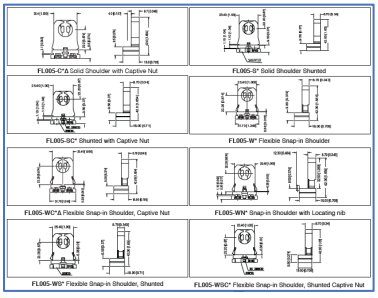
There are thousands of manufacturers of LED Tube lights (TLEDs) Operating today. These TLEDs are designed to fit directly into the standard fluorescent tube G13 'tombstone' sockets. Some use internal drivers compatible with 110-277 Vac Primary Power delivered by rewiring the tombstones. Some use internal drivers with limited compatibility to the output of some Fluorescent Ballasts. The best TLEDs use an external LED Constant Current Driver to provide the low-voltage drive to the TLED via the tombstone terminals. All these TLED designs require the use of the bi-pin G13 connections for mechanical installation of the TLED Replacement and to provide power to it.

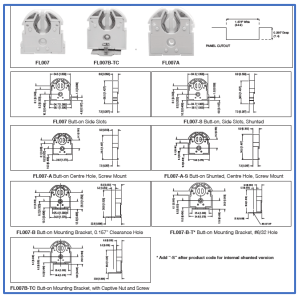
Some Lessons Learned from using TLEDs for Fluorescent Tube fixture Retrofits

Issues with using original G13 sockets for TLED Replacements:

1. These sockets are typically old, being part of the original fixture installed years ago. They use plastic housings which can become brittle, get cracked over the years, even burned by arcing due to the high frequency, high voltage imposed by many fluorescent ballasts.

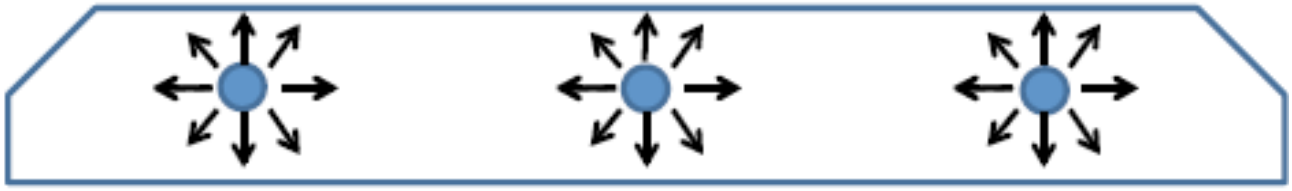
2. Roughly 50% of the installed base of these G13 sockets are internally shunted between the two adjacent pins according to DOE Surveys. This requires them to be replaced with new non-shunted versions for compatibility with most TLED installations and rewiring requirements. When replacing an original tombstone socket, one must ensure the replacement unit is physically compatible with the mounting scheme employed of which there are more than 60 unique common styles. See 42 commonly installed tombstone styles below:



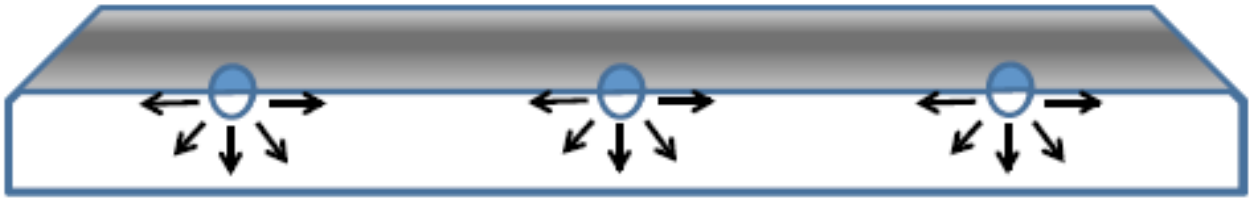


3. Using the installed tombstone sockets dictates the physical location in which the TLED replacement is positioned in the fixture. Not only is this non-optimal for the LED emission patterns and from a final fixture lighting distribution perspective, it also makes de-lamping a 3 or 4 tube fixture awkward, asymmetrical and aesthetically unappealing.

4. The position of the sockets relative to the back surface of the fixture forces the LED replacements to be installed closer to the front aperture than would be the optimal location for light distribution with the luminaire as shown in the figures below:



Emission pattern of Fluorescent Tubes in a typical drop-in troffer
Spherical output pattern 'Fills' the entire body of the fixture



Emission pattern of LED TLEDs in a typical drop-in troffer
Directional output pattern leaves 50% of the fixture Dark, giving a 'Cave-Like' Appearance

5. The time required to rewire and frequently replace the sockets adds to the installation labor. On a single job, the installer can't know until they open up a fixture what type of sockets are installed and if they need to be replaced. Difficulty in locating the correct G13 replacement sockets can delay progress.

6. Employing the original G13 sockets to provide drive power to a TLED is operating them in a voltage and current range outside of their original design specifications.

A History of Huge Global Recalls on TLEDs from Top Lighting Companies:
These products have been the subject to some of the biggest global recalls in Lighting by several of the biggest manufacturers in the world. Collectively, Cree, Osram-Sylvania and General Electric, have recalled millions of these TLEDs within the past five years. Cited reasons included danger of electrical shocks, bursting into flames and dropping out of the fixtures. See links below for some of these recalls.

https://www.cpsc.gov/Recalls/2018/ge-lighting-recalls-led-tube-lamps-due-to-shock-and-electrocution-hazards-sold

https://www.cree.com/t8-recall-2016

https://luxreview.com/article/2018/06/ge-recalls-led-tubes-over-electrocution-fears

http://lightedmag.com/osram-sylvania-recalls-t8-led-tubes-due-to-fire-hazard/

https://www.ledsmagazine.com/smart-lighting-iot/smart-cities/article/16697111/philips-recalls-99000-led-lamps-for-shock-hazard

https://www.ledinside.com/news/2015/9/led_t8_tubes_tops_north_america_recall_lists_in_2015

So, Why Not Just Replace all Old Fluorescent Fixtures with a completely New LED Fixture instead of using an LED Retrofit?

For many fluorescent luminaires installed in commercial/industrial spaces, some argue that the choice of what type of LED upgrade should be applied is viewed solely as the tradeoff between installing a completely new LED fixture or replacing the old fluorescent components with an LED retrofit. Clearly, it's true that a new LED fixture is going to be more efficient than the fluorescent fixtures they would be replacing. However, there are solid financial, functional, performance and environmental reasons to consider the retrofit approach as detailed below:

The installed cost of a good quality LED Troffer replacement will be higher than the best retrofit options. When shipping, installation labor, building permit requirements and disposal cost are all factored in, it costs roughly twice as much to execute a complete fixture replacement with a new LED fixture.

a. Typical disposal is done by dumping the old hardware in a landfill, a non-sustainable action.
b. Breaking the ceiling envelope can necessitate the issuance of a building permit and the need to bring ALL other components in the plenum space up to current codes. This can escalate the total cost 3-5 fold depending on the age of the building, location and local code requirements.
c. Even simply swapping the fixtures takes >twice as much labor as a good retrofit.
d. Shipping costs to deliver the new fixtures to the job site are much higher due to the larger size, weight, and fragility of an entire luminaire.
e. New LED fixtures are generally not operating at the highest levels of efficacy commercially available. These fixtures are generally more than two years behind the current state-of-the-art in LED Lighting.

With all the well-known downsides of using TLED retrofits what other choices are available?

This white paper is not to review every available troffer retrofit option available but will focus on the contrasting the TLED approach and the RedBird LED Stripit Kit® product. The Stripit Kit® is widely acknowledged to deliver the highest efficacy of all currently available fluorescent tube retrofit solutions. It is a universal retrofit solution that eliminates all of the negative aspects with TLED retrofits and provides the Highest-Quality LED retrofit choice. With installed efficacy levels > 190 lumens/watt the Stripit Kits provide the greatest energy savings. Even today, most indoor LED lighting fixtures are merely slightly reworked fluorescent fixture designs with LED strips installed in place of the fluorescent lamps. In other words when a 'New' LED fixture is purchased, it's often just an old fluorescent fixture design with a factory installed LED retrofit. With this being the case, along with all other reasons itemized above, why pay for an entire new fixture?

Typically, replacing a fluorescent troffer with a new LED Troffer requires a building permit. Installing a Stripit Kit upgrade is classified as standard maintenance, does not require a building permit and maintains the UL compliance of the original fixture. In many locations, any work that breaches the 'Ceiling-Envelope' not only requires a building permit and inspection, but also mandates that any other systems in the plenum space be brought into 100% compliance with current building codes. Rewiring, changing the HVAC ductwork, the removal of asbestos and other outdated materials is often required adding a huge cost and time premium to the lighting upgrade project.

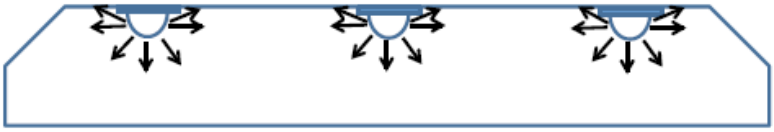
Sound Reasons to choose an LED Retrofit Upgrade Over Replacing the Entire Fixture

1. As described above, the labor and related costs for the removal and proper disposal of complete fluorescent fixtures are substantially more than the costs of the removal and disposal of just the fluorescent tubes and ballasts alone. At the very least, accumulated dust and dirt broken loose in the removal/replacement process must be dealt with. This is particularly important in healthcare facilities.
2. Furthermore, it is simply going against the general concepts of sustainable practices to load our landfills with old lighting fixtures which could easily and cost effectively be updated with a good LED retrofit, providing another 10-20 years of quality service. While these old fluorescent fixtures often contain steel and aluminum materials that could be recycled, the sad fact is that almost none of them are processed in that fashion.

Stripit Kit® The Highest Efficacy, Longer Lasting, Retrofit Solution: The RedBird LED Stripit Kit® solution addresses all the shortcomings of a TLED approach and provides a longer life, faster installation, premium solution, for upgrading any type of installed fluorescent tube fixtures. As described above, the non-optimal positioning of the TLEDs using the old tombstones is overcome by one of the less obvious advantages of using the Stripit® solution versus a TLED approach as detailed below.

Redbird Stripit Kit® Eliminates the Non-Optimal Positioning Problem with TLEDs

As the Stripit Kit® system employs a screw mounting on the top of the housing and the proprietary Stripit Kit® snap-on diffuser lens, the emitted light is distributed evenly throughout the entire fixture housing as shown in the diagram below. Stripit Kit® takes advantage of the inherent directionality of LEDs while at the same time, successfully 'filling' the entire fixture with light similar to the original fluorescent tubes. Also, being freed from the constraint of using the old tombstones allows the installer to determine an optimal placement within a given fixture allowing the ability to de-lamp from a 3 or 4 tube design to a 2 Strip solution and still provide a balanced, symmetrical look to the completed fixture.



Emission pattern of RedBird Stripit® System in a Typical Drop-in Troffer.
Mounting the LED Strips on upper Surface Provides 100% 'Light-Fill' of Troffer

Different Emission Patterns of LEDs and Fluorescent Tubes Beyond the obvious increases in efficacy and functional lifetime, one of the biggest differences between fluorescent tubes and TLEDs stems from the fact that LEDs are inherently directional in their emission pattern while fluorescent lamps are not. All the light from an LED emanates from the front with a typical beam pattern about 120° wide, with none from the back side. Light from a fluorescent lamp radiates spherically, 360° in all directions. This is seen by some as a problem for TLEDs when it comes to using them for a retrofit. This property has always been one of the fundamental problems when trying to design an optically efficient fixture for fluorescent lamps. For example, in any fluorescent fixture less than half the light from the lamps has a direct path to exit the fixture. The rest of the light from the fluorescent tube must be reflected off one or more surfaces before it enters the workspace. As reflective surfaces (even a mirror) are never perfect (frequently just white painted metal that is ~ 70% reflective and is a scattering element as well), each reflection reduces fixture efficiency. In the manufacturer's specifications for the most common types of fluorescent troffers, the optical efficiency of these fixtures is measured to be between 65 and 75%. Replacement LED lamps don't have this problem. Essentially 100% of all light produced by the LEDs has a direct path to exit the fixture.

The TLEDs positioning within the troffer is not optimal. The existing tombstone sockets are optimized for fluorescent tubes, not for LEDs. As there is no light from the back of a TLED the body of the fixture above the TLED is dark and appears cave-like, not what the troffer was designed for. Additionally, while the directional nature of the TLEDs means they're operating near 100% optical efficiency within the troffer, by not filling the bulk of the fixture with light and the multi-bounce reflections that drive resultant fixture radiometric illumination pattern, the final distribution of light from a TLED fitted troffer has a much narrower pattern than what the original fluorescent tubes produced. In a radiometric test, this would mean a smaller 'spacing-criteria' for the retrofitted troffer. This contributes to a greater level of variance in light levels over the work area. (Brighter below each troffer, dimmer in the spaces between troffers.) This reduction in the troffer 'spacing-criteria' was one of the main reasons very few TLEDs were able to meet the Design Lights Consortium (DLC) Qualification standards. Ultimately, the DLC dropped this requirement…

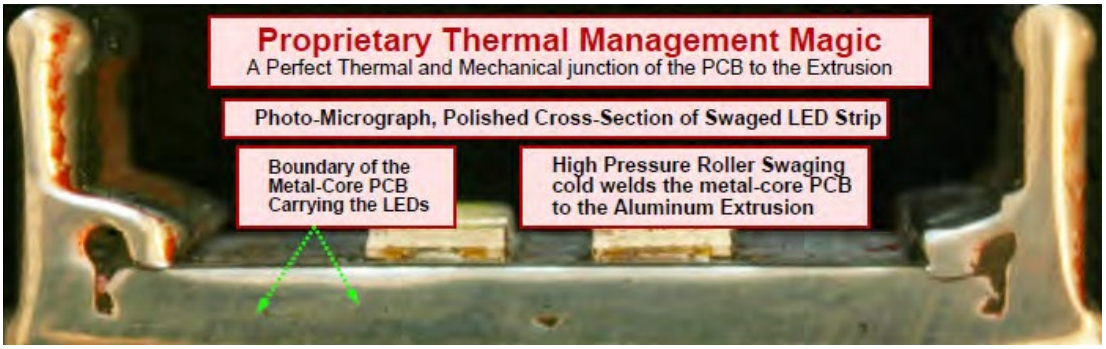
Additional Redbird Stripit Kit® System Advantages Over TLEDs

1. The RedBird Strip Elements employ a unique design. Each Strip includes a custom aluminum extrusion into which the LED Printed Circuit Board (PCB) is inserted and swaged in place with a proprietary process that permanently embeds the PCB within the extrusion. The assembled LED Strip extrusion is shown below:

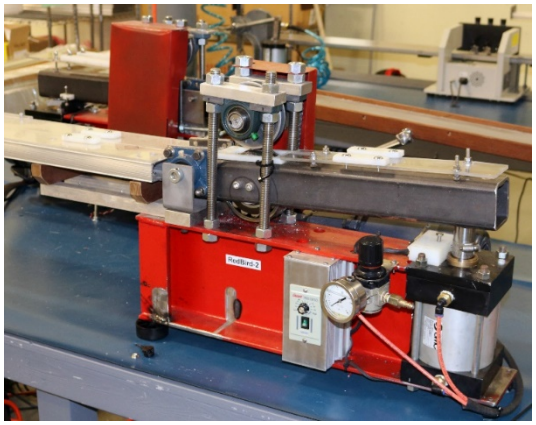
Specific beneficial functions of this design are

a. Provides a massive heatsink to ensure the LED components stay very cool, even when driven at high power levels. Cooler LEDs operate at higher efficacy levels and last longer without degradation.

b. The high-pressure swaging permanently embeds the LED PCB into the extrusion and guarantees the best thermal connection without needing any messy dielectric grease or thermally conductive tape. The swaging process creates a cold-welded bond between the PCB and the extrusion. See images below:



Molecular Diffusion via Cold-Weld Process

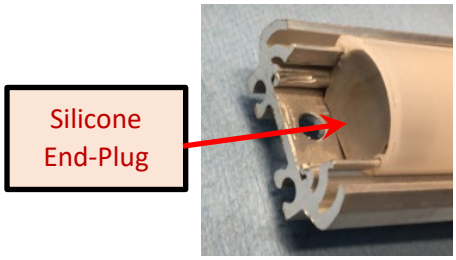


RedBird High-Pressure Production Auto-Swager

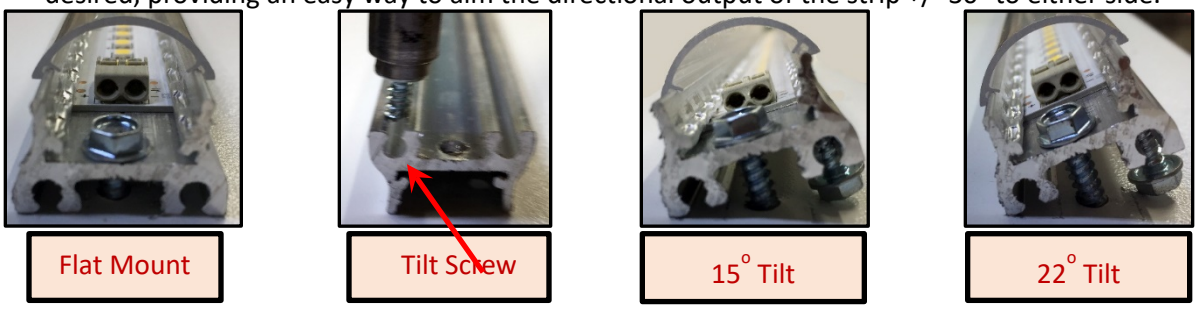
c. The extrusion has flanges to accept tough polycarbonate snap-on lens, either crystal clear or frosted. When snapped in place, the lens element protects the LEDs from direct impacts they might experience

in active environment such as a sports gymnasium. If not required, the lens/diffuser can be left off which enables operation at a bit higher efficacy.

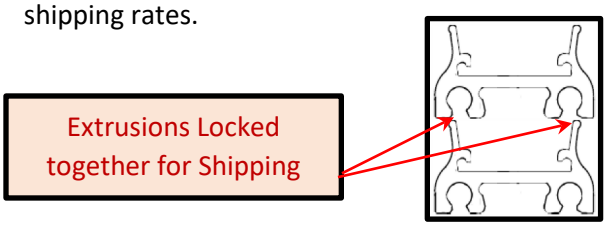
d. A silicone end plug can be installed in the space formed at each end of the strip to seal the unit against dirt, bugs and moisture infiltration. See below.



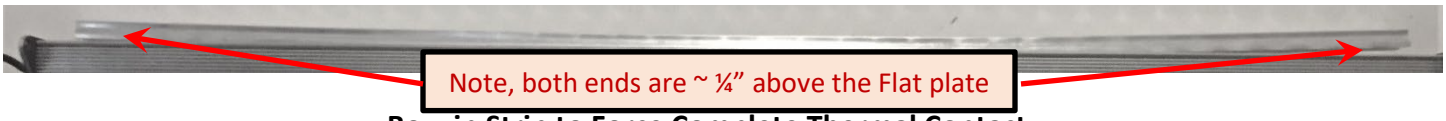
e. The channels on the bottom of the extrusion allow a field adjustable tilt to be set during installation if desired, providing an easy way to aim the directional output of the strip +/- 30° to either side.



f. Perhaps one of the most valuable functions the extrusion provides is to protect against damage in shipping. i.e. When the Strips are shipped in bulk quantities, the extrusions are stacked in a 'locked-together', nested fashion. The bottom of each strip fits precisely onto the top of the strip below, shielding and protecting the LEDs and push-in connector from damage during transit. Stacks of up to 20 strips are then bound with strapping tape forming a compact and mechanically robust assembly for packaging 45-60 pcs per carton. This makes shipping large quantities cost effective and essentially damage proof. The result is that it is like shipping a few pieces of dimensionally tough aluminum in the shipping cartons. This toughness, damage resistant nature and drop-test results qualifies them for lower shipping rates.



g. The production swaging process is designed to put a very slight concave bow in each strip. (See photo below) When installed in a fixture with a TEK-Screws at each end, this slight bow ensures that the total length of the strip is held in constant thermal and mechanical contact with the mounting surface.



Bow in Strip to Force Complete Thermal Contact