

## TECH BRIEF

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Understanding the benefits of lithium vs. nickel-cadmium battery technologies

Engineering best practices for lithium-powered emergency drivers

Embedded material handling process for continued Quality Assurance

IOTA "LP" lithium-design solutions portfolio

The internal battery pack of any emergency driver is the heart (and quite literally the bulk) of the driver's system design. Traditionally, this design employs industrial-grade nickel-cadmium ("ni-cad") batteries to provide a robust, rechargeable solution and serve as an effective power source for the fixture's emergency lighting function. New battery technologies, however, are continually being developed for a variety of industrial applications. Of these new technologies, lithium designs have emerged as having practicable and efficient advantages for emergency lighting.

### Lithium vs. Nickel-Cadmium

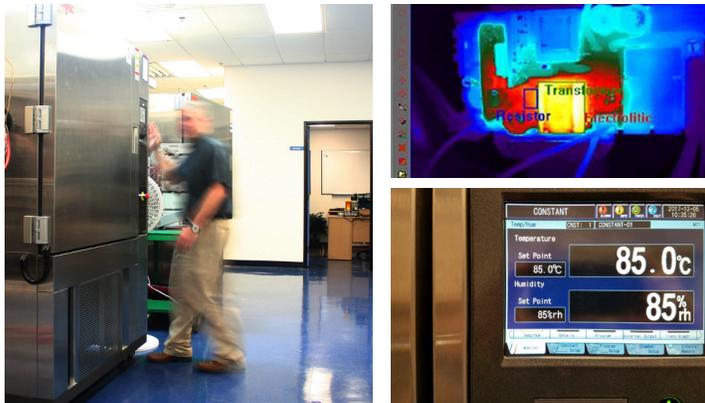
For IOTA® low profile ("LP") emergency drivers, lithium-iron phosphate (LiFePO<sub>4</sub>) batteries deliver significant benefits in **decreased size and weight**, allowing the use of integral emergency driver solutions within minimal luminaire spaces not feasible with traditional ni-cad batteries. Additionally, lithium battery cells operate at a **higher voltage** than ni-cad counterparts (3.2V for LiFePO<sub>4</sub> vs. 1.2V for nickel-cadmium), meaning fewer batteries are needed to achieve the desired electrical performance for the system.

### Engineering Diligence

Reaping the benefits of lithium technology is not simply a matter of 'changing a battery' within a driver. Since emergency lighting equipment carries a critical responsibility of reliable performance within a variety of demanding installation and environmental conditions, batteries used in IOTA equipment must pass **rigid performance criteria**. Failure of the battery to perform under a range of conditions can have consequences far more serious than simply a loss of Certificate of Occupancy or monetary fine. For this reason, IOTA carefully analyzes and evaluates the battery to verify its ability to meet strict **temperature, humidity, and electrical standards** for proper long-life performance. Additionally, these emergency driver designs are engineered to provide correct charge cycles to the battery: for example, *traditional ni-cad batteries* require a continual 'trickle' charge to maintain the battery in a state of readiness but this continual 'trickle' charge algorithm has *adverse impacts on lithium battery technology*. IOTA "LP" emergency driver charging circuits are designed to essentially remain 'off' during standby mode, activating only periodically to provide a **boost charge to the battery as needed**. This ensures the lithium battery is properly maintained without negatively affecting its ability to perform in the field for optimal life.



▲ Above: side by side comparison of a typical 10-watt emergency driver with ni-cad battery (left) and 10-watt driver with lithium battery (right)



▶ Left: IOTA engineering practices use environmental test chambers and thermal imaging to verify proper performance of emergency batteries.

## Material Handling Best Practices

Proper implementation of lithium battery designs extends well past the engineering design phase. IOTA has established careful procedures and facility enhancements to ensure product quality is maintained even after the product has left the factory.

All batteries will naturally self-discharge over time. Due to the sensitive nature of lithium technology, a complete discharge of the battery can result in an unrecoverable state, rendering a lithium-powered emergency unit useless. This risk is negligible for units once in service in the field, where the battery is properly maintained by the charging circuit's periodic boost charge. However, for battery products sitting on warehouse shelves waiting to be connected to power, the chances of naturally discharging to an unrecoverable state are much greater.

To reduce the potential of naturally-discharging batteries, IOTA has established a careful procedure for proper maintenance of "LP" emergency drivers. **Specialized charging equipment** has been provided for use at the WRDC distribution center in Ontario, California. When units are received at the distribution center, they **undergo an initial charge before being placed into inventory**. From that point, inventory cycles are monitored and any IOTA "LP" emergency drivers that have been 'on the shelf' for a period of six months are returned to the charging equipment for **proper maintenance charging**.

Additionally, IOTA "LP" emergency drivers are currently designated for inventory specifically in Ontario, California's **climate-controlled** facility. This is due to the fact that the temperature significantly impacts discharge rate of lithium batteries. Maintaining inventory in a facility with moderated climate adds an additional level of quality control and product confidence for IOTA customers.

## Product Identification and Markings

IOTA products that utilize lithium technology are noted in the model name with the identifier "LP" - for example, an IOTA emergency driver ("ILB") with a low profile lithium battery will include the "LP" suffix, such as "ILBLP CP10." Refer to **Figure 3** for a current reference of IOTA "LP" emergency driver designs that currently undergo the practices described in this article.

**Packaging labels** are also applied to "LP" emergency driver master cartons to easily identify these types of products. This labeling is for compliance with national and international guidelines for the battery shipments. Requirements will vary depending on the nature of the product (battery installed within an apparatus) and the size of the battery. Like all IOTA products, "LP" emergency driver designs have undergone **thorough 'drop-testing' to ensure that product packaging effectively safeguards product** during handling and transportation. **Unit labels** also include the "LiFePO<sub>4</sub> recycling" mark to encourage proper handling of end-of-life components and responsible stewardship of our environment.



▲ Above: Examples of LP product and packaging markings.

## Designed for Customer Confidence

From careful engineering and evaluation practices to conscientious inventory management and material handling processes, IOTA "LP" emergency drivers are designed to offer more than just a size and weight convenience. Extensive effort is applied to every aspect of the customer experience to **deliver confidence in both product and service performance**. For additional information on IOTA "LP" emergency solutions, visit [www.iotaengineering.com](http://www.iotaengineering.com) or call **1-800-866-4682**.

IOTA Lithium Design Model	Description
ILBLP CP10 HE SD	10W Emergency Driver, 10-60VDC
ILBLP CP15 HE SD	15W Emergency Driver, 10-60VDC
ILBLP CP20 HE SD HV	20W Emergency Driver, 55-200VDC
ILBLP CP30 HE SD HV	30W Emergency Driver, 55-250VDC

◀ Figure 3: IOTA Emergency Drivers featuring "LP" Low-Profile Lithium Technology.

IOTA®, an Acuity Brands company, develops and manufactures premium solutions for emergency lighting needs and battery charging applications. Designed and engineered by industry experts, manufactured and quality-tested to the highest standards for confident operation, and supported by our knowledgeable customer service team. Visit [www.iotaengineering.com](http://www.iotaengineering.com)

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