



Operational Performance and Longevity in Extremely Hot Climates

Introduction

The Ambient Temperature Operational Range of the CAST LED Perimeter Light (CPL1) is (-)40°C to (+)55°C. The upper temperature limit is far beyond nighttime temperatures in all parts of the world. There is concern among specifiers, however, that certain regions have daytime temperatures as high as 80°C and nighttime temperatures as high as 50°C. The primary concern being that heat is absorbed into the luminaire body during the day, and retained into the nighttime operational period - thereby exceeding temperature limits. The following points address that concern. A secondary concern is that high daytime temperatures might damage electronic components even when not operating.

Heat Absorption, Retention, and Dissipation of the CPL1

Luminaire construction and design factors that ensure rapid cooling of the luminaire and its components as daytime temperatures lower into nighttime:

- ▶ Luminaire body is constructed of an aluminum alloy with a light gray color that reflects the sun's radiant energy to a significant extent.
- ▶ Luminaire body has no coating that would otherwise act to insulate the body and inhibit heat transfer.
- ▶ All parts of the luminaire (hat, base, stem, and junction box) are thermally connected and present a large surface area for thermal transfer.
- ▶ The most sensitive components (LED array) are protected from the sun by the hat, and are also situated in an open part of the luminaire. This allows unhindered airflow that aides in heat transfer.
- ▶ The electronic driver (located in the junction box) is potted in a thermal transfer epoxy that ensures any stored heat will effectively transfer into the body.
- ▶ LED array is mounted directly to the luminaire body (with thermal gap pad) so heat transfer is rapid.
- ▶ Separation of LED array and driver effectively separates these two components (that both generate a portion of the heat)

Affect of High Daytime Temperatures on Electronic Components (while not in operation)

Even when daytime temperatures exceed 80°C, all electronic components are still within safe temperatures (while not in operation). The following are the temperature ratings of the components:

- ▶ LED Array (Cree XPEHEW): Max. Junction Temperature (Tj max): 150°C
- ▶ Driver: (proprietary): Max. Temperature Rating: 125°C

Affect of Occasional Temperature Extremes Where Nighttime Temperatures Exceed Limits

The 55°C upper limit in the operational range represents a safe temperature for continuous operation. Occasional periods where nighttime temperatures exceed that limit will not damage the electronics. The following points show how extreme ambient conditions still result in temperatures within the component specs.

An 80°C Ambient Temperature results in the following component temperatures (during operation):

- ▶ LED Array: 120°C (limit is 150°C)
- ▶ Driver: 125°C (limit is 125°C)

Conclusion

The design, construction, and selection of components for the CAST LED Perimeter Light ensure optimal performance and longevity even under temperature extremes found in the hottest regions of the world.