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Retrofit LED Outdoor Lighting Key Design Challenges

Retrofit LED Design Challenges

- Retrofit Value Proposition
- Delivering the Customer's Requirements
- Key Considerations
- Anticipating the Future
- Evluma Clearlight Highlights

Retrofit Value Proposition

- Ease of Installation
- Logistics and Supply Chain
- Customer Perception
- Attractive overall Life Cycle Costs



Delivering Customer's Requirements

- Illumination
- Electrical/Utility Requirements
- Applications and Existing Luminaires
- Heavy Focus on Customer Perception
- Seek out every Stakeholder's involvement
- Dark Sky and CCT
- Future Lighting Codes
- Provide LM 79(TM 21) on the web

Key Considerations

- LED Junction Temperatures
- Driver Electronics
- High Heat Flux conditions/Day burner protection
- Weather Protection
- Power Quality
- Safety
- Choice of Materials
- Mercury in the Environment

Anticipating the Future

- Energy Star/Caliper testing
- Climate Legislation
- ASHRAE/IESNA
- Participate in Industry Associations
- Represent the SSL Industry with Quality and Integrity

Evluma Clearlight for NEMA V Applications

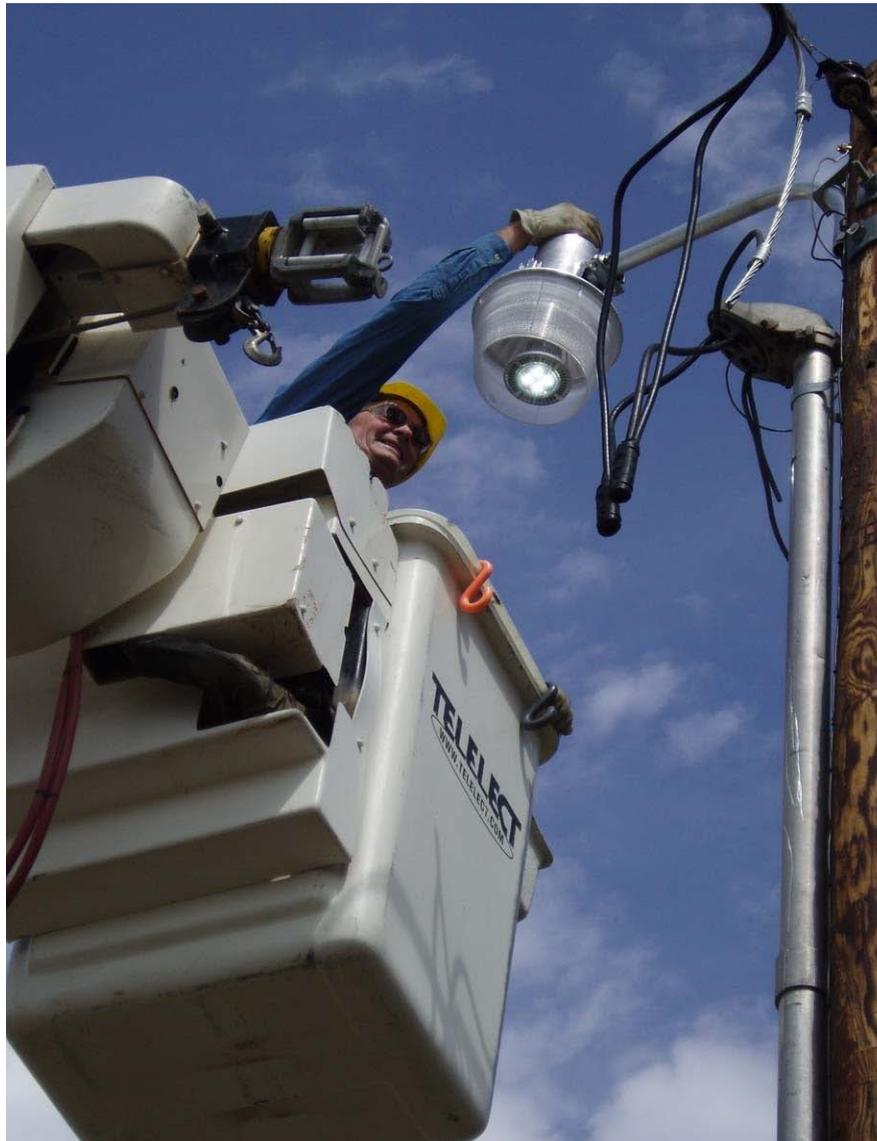
- Lumen Output: 2,200 – 3,500
- Input Power: 40 - 55 W
- Power Factor: $>.9$
- CRI: 74
- CCT: 4100 and 6100
- L70: 70,000 hrs. with Cree MCE and XPG
- IEEE Class C Lightning Strike
- ROHS compliant
- NRTL Certification (pending)



Evluma 40W Clearlight Retrofit

- Specifically Designed for NEMA V Security Light Market – 10MM Units estimated in US
- Screw in Mogul Base Installation
- Option to use Legacy Ballast or delete
- Active Cooling - Nuventix Synjet® and Heat Sink
- Electronically Limited Solder Point Temperature based on Cree MCE/XPG LM 80 data
- Dark Sky and Wide Area models
- Favorable Life Cycle Cost

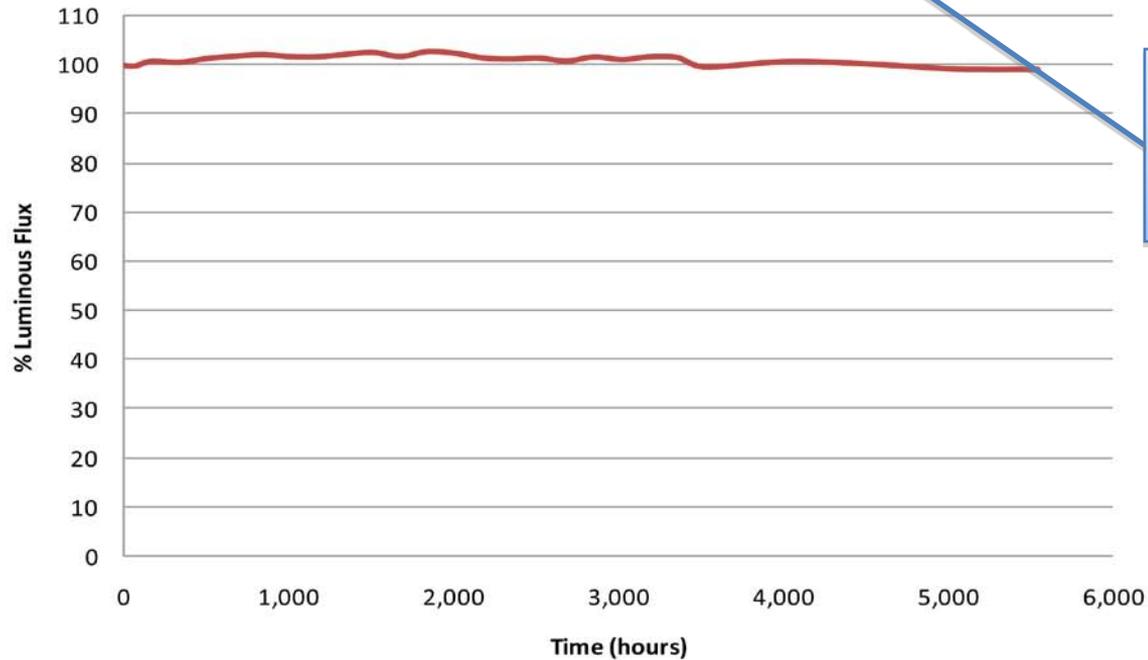
Simple Installation



MCE LM 80 @ 700 ma

XLamp MC-E Cool White Results (Ta=85°C)

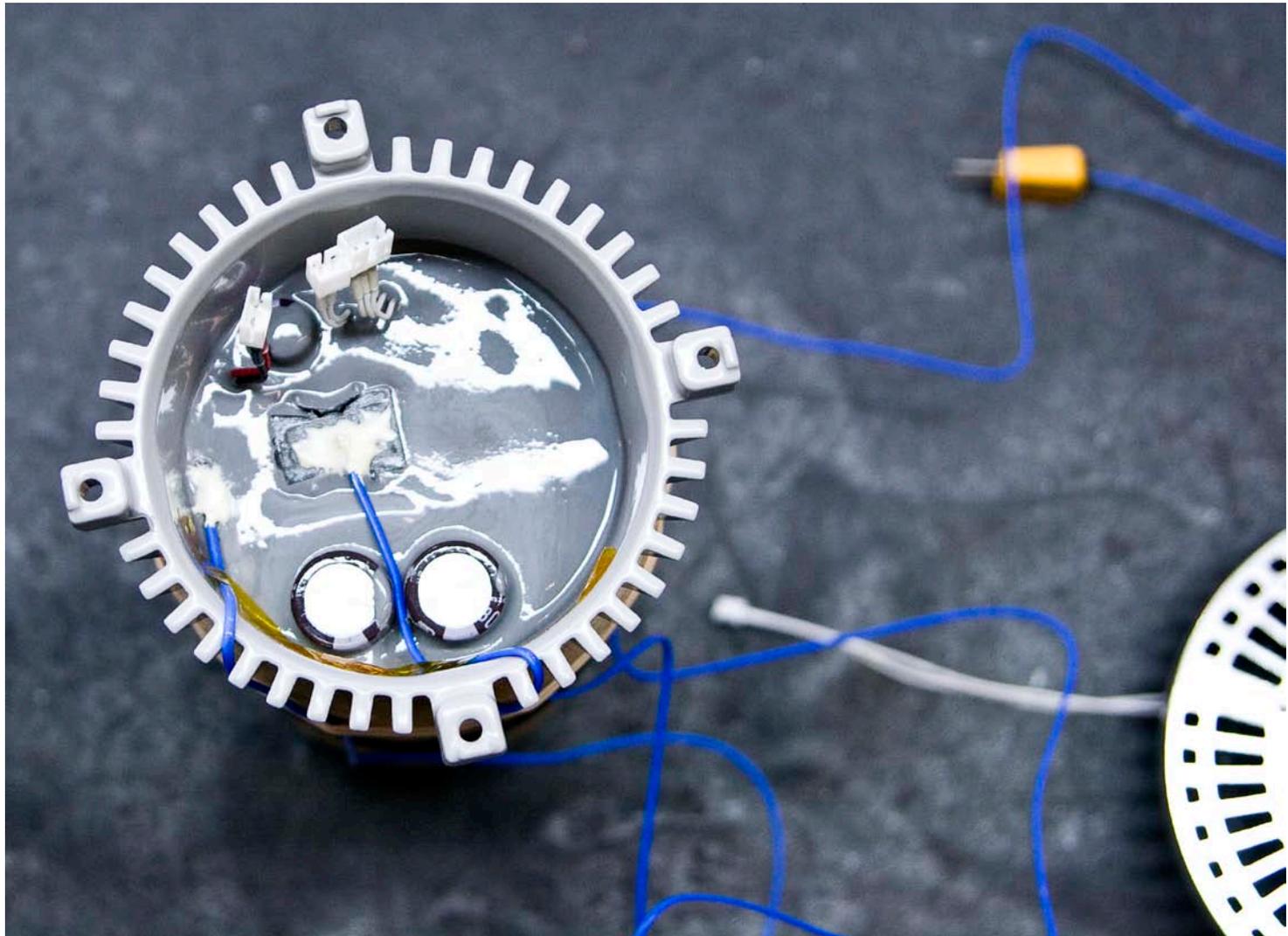
Current	Ta (°C)	Tsp (°C)	Tj (°C)
700 mA	85	85	115



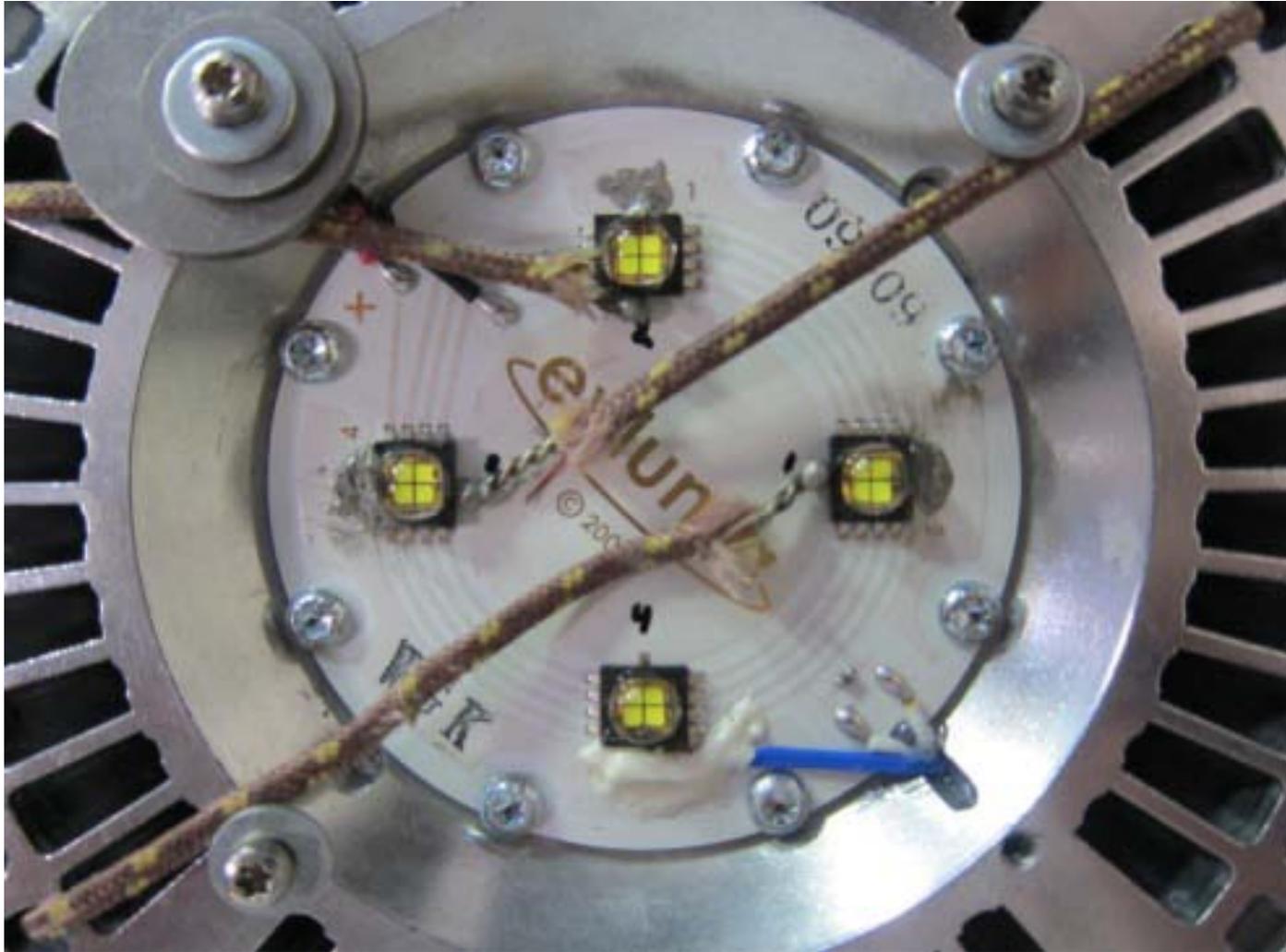
Clearlight Senses Tsp and rolls If back @ 65C

— 700 mA

In-Situ Thermal Test Rig



In-Situ Thermal Test Rig



In-Situ Thermal Test Rig

- Clearlight LED lamp luminaire installed in a barn style light fixture.
- The following component temperatures were tested
 - LED pad temperature
 - FET
 - Flyback Transformer



In-Situ Thermal Test Rig



In-Situ Thermal Testing @ 40C

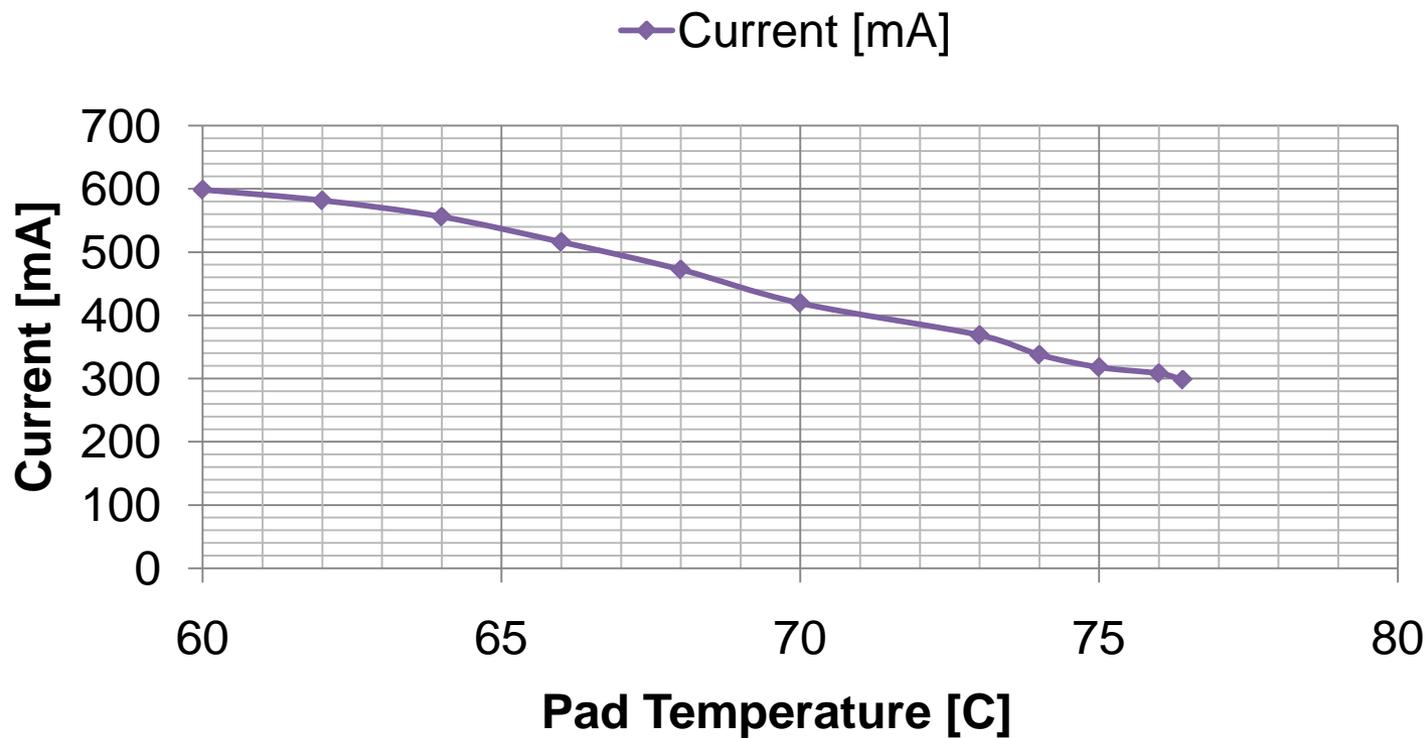
- The Bottom of the box was held at 40C +/-1C.
- The Top fluctuated from 45-55C
- The Temperature near the inlet fluctuated from 42-44C
- Baseline LED Pad Temperatures stabilized at 54C measured at ambient 25C

Steady State Temperatures

FET	73C
Flyback Transformer	80C
LED Pad	72C

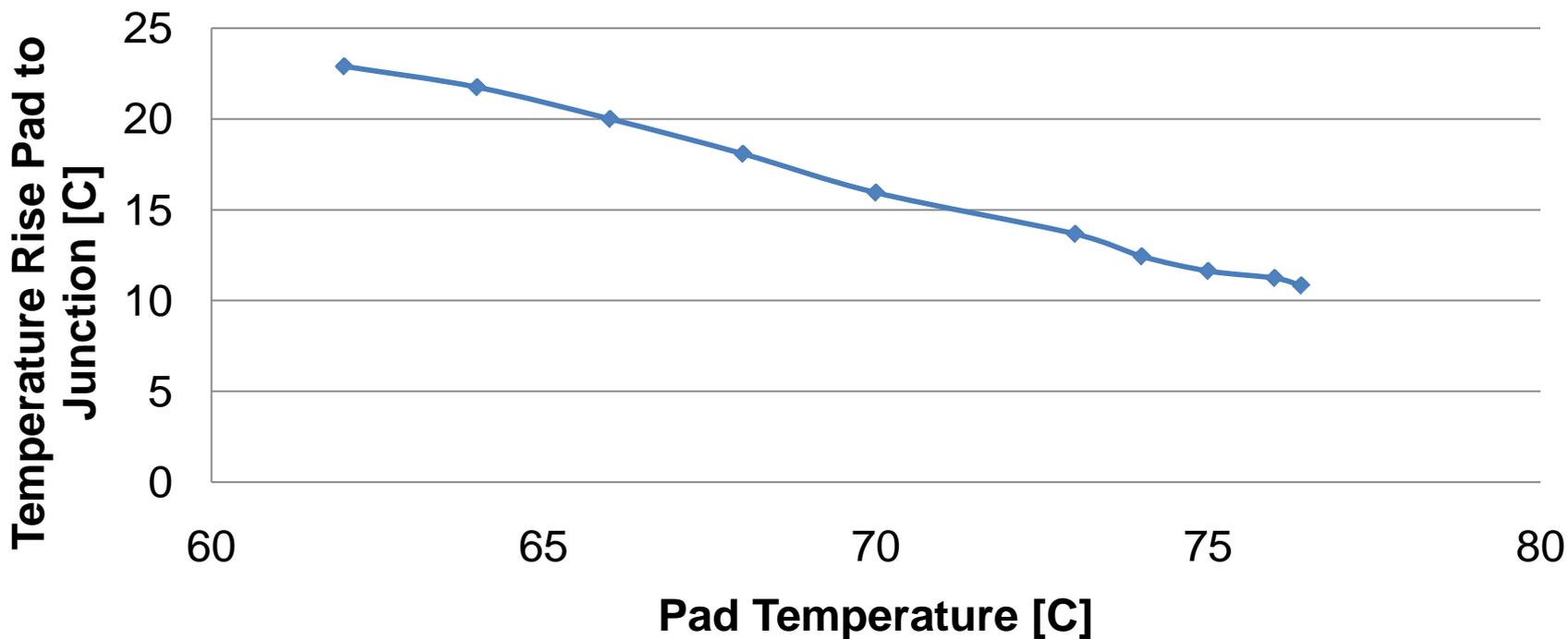
In-Situ Thermal Testing @ 40C

Current vs. Pad Temperature



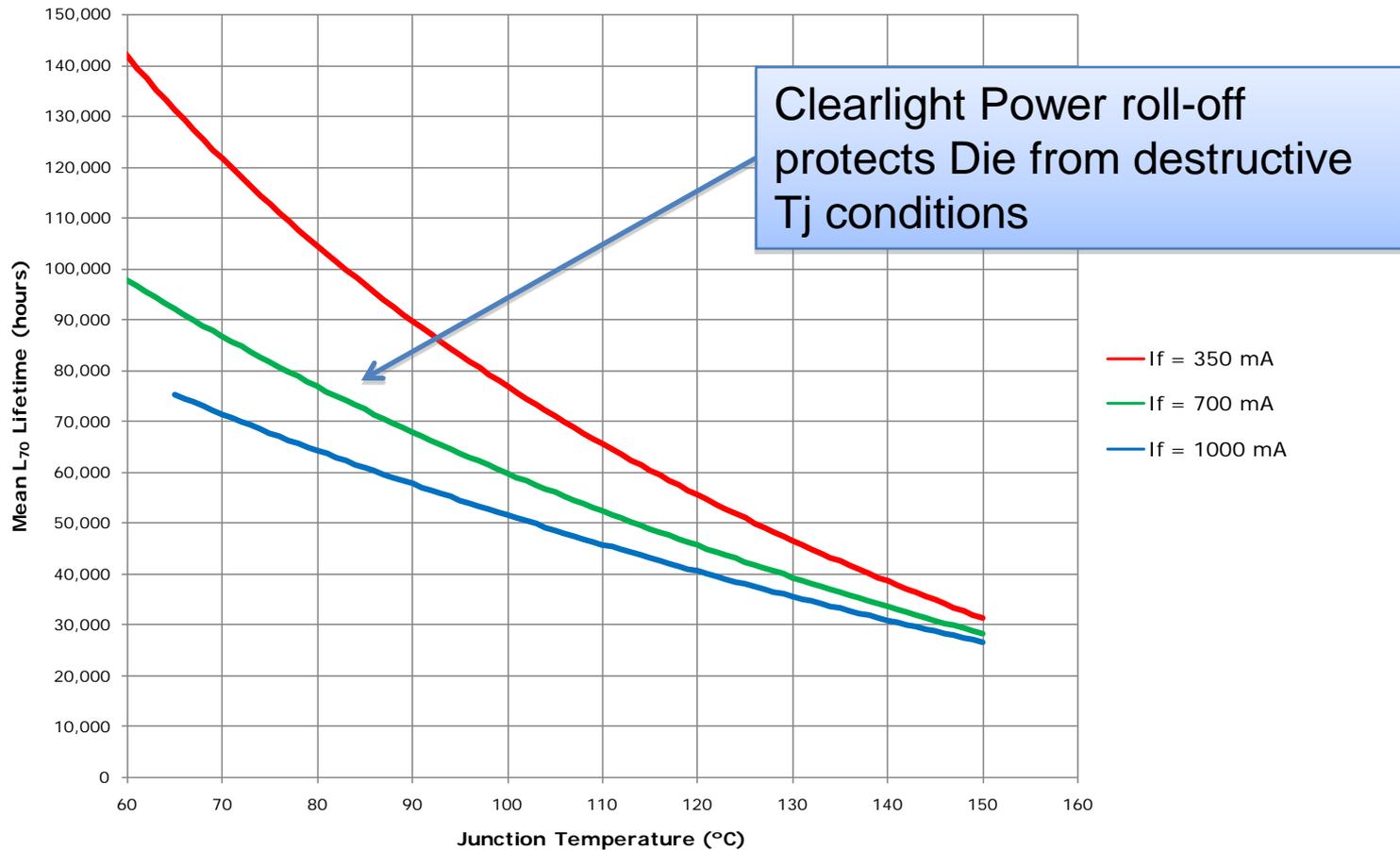
In-Situ Thermal Testing @ 40C

Junction Temperature Rise vs. Pad Temp



XRE L70 for reference

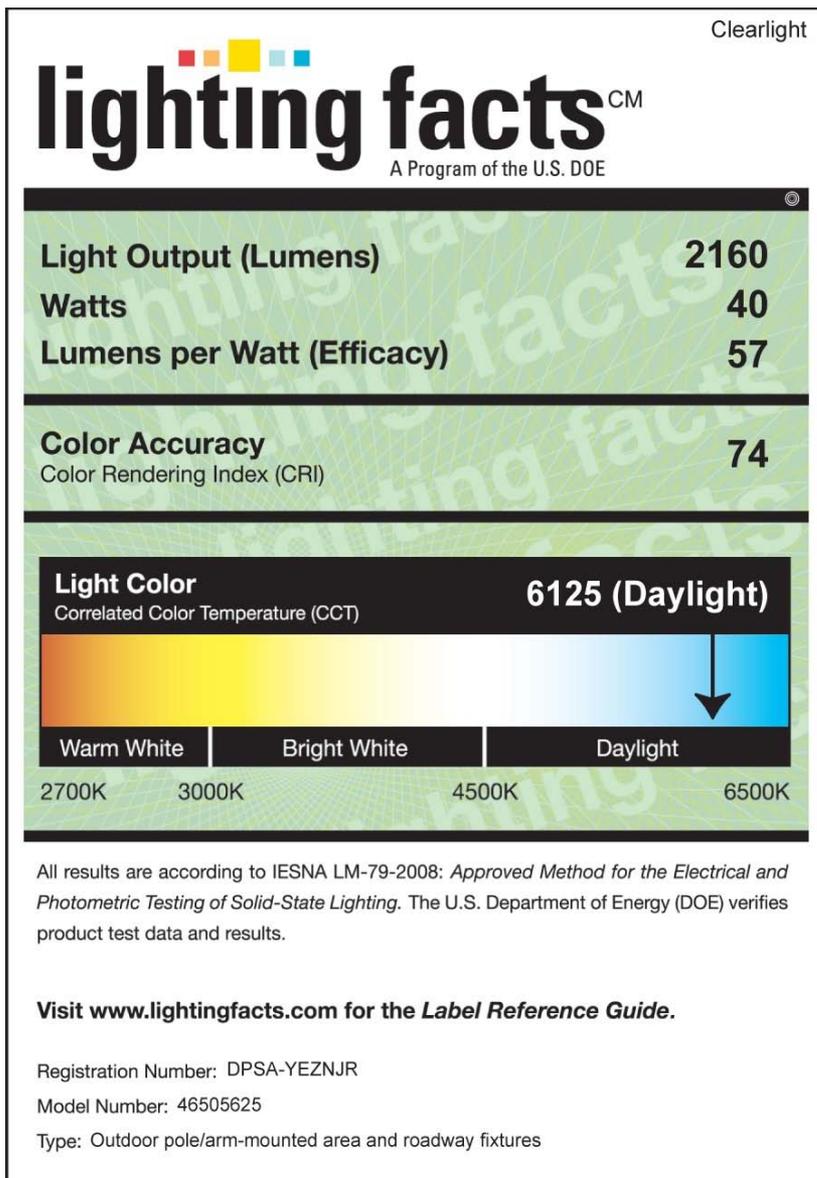
Cree XLamp XR-E White L₇₀ Lifetime Prediction - T_{AIR} = 35°C



Insect Debris @ 18 months



SSL Quality Advocates







Conclusions

- Properly designed, LED Retrofit outdoor lighting can offer Attractive Life Cycle cost benefits
- Retrofit approaches can require more research and due diligence than OEM
- Intimate Customer relationships are critical during development phase
- Real World testing in addition to solid 3rd party Laboratory certification is a must
- Outdoor Lighting is a changing marketplace – Continuous Development is Rewarded

Thank You!

