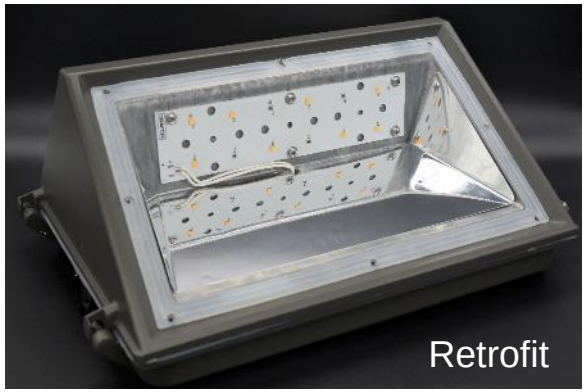
1800K CCT Outdoor Wall Pack Reference Design

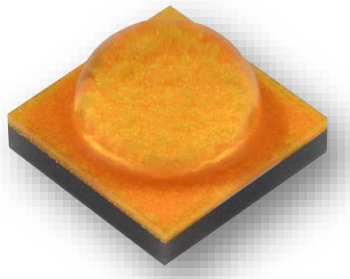
XLamp® XP-G3 White Standard LEDs

XLamp® XP-G3 LED 1800K Wall Pack Reference Design Overview



- The purpose of this retrofit is to highlight the capabilities of the XP-G3 1800K LED option for outdoor applications.
- Primary Objectives:
  - Retrofit an existing off-the-shelf High Pressure Sodium (HPS) wall pack with the updated XP-G3 LED.
  - Demonstrate that these new 1800K Cree LEDs contain a lower “blue content” compared to 4000K LEDs and can be used as an alternative to HPS in order to reach the HPS color point - especially important for some outdoor lighting installations.
  - Show LEDs as a viable lighting alternative to HPS with upside performance benefits including improved system cost ($400 energy saving over fixture lifetime), higher CRI , higher LPW.

XLamp® XP-G3 White Standard LEDs: New 1800K Options

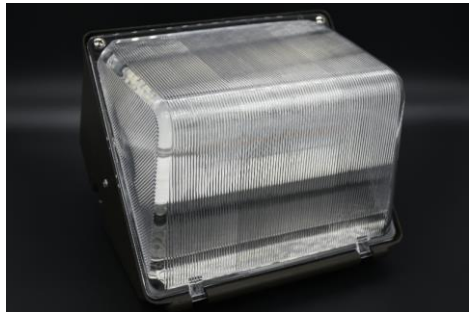


- Replicates the warm yellow glow of High Pressure Sodium (HPS) lamps
  - Commonly used in industrial and outdoor lighting

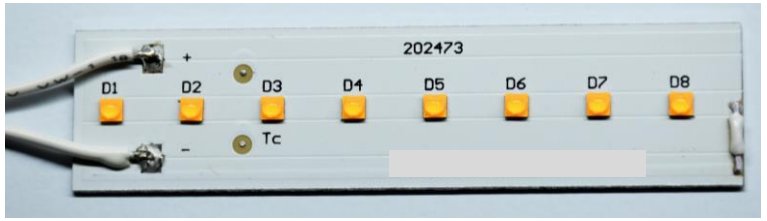
- XP-G3 LEDs provide many application benefits over existing HPS lamps:
  - Up to 2x higher efficacy (LPW) for massive reductions in electricity usage and utility costs
  - Better optical control for less sky glow
  - Higher CRI & TM-30 Rf for improved color appearance
  - Longer lifetime for reduced maintenance costs
  - No mercury content
  - Cuts total blue light content to about half
  - No increase in ~450 nm blue content

Comparisons & Results

Comparison – HPS Wall Pack vs Cree LED retrofit



- Goals
  - Use an off-the-shelf 2000K HPS wall pack fixture and bulb
  - Replace the reflector and bulb with a 2000K Cree LED light engine (8 LED strip/heatsink in place of the bulb)
  - Match the CCT at 2000K

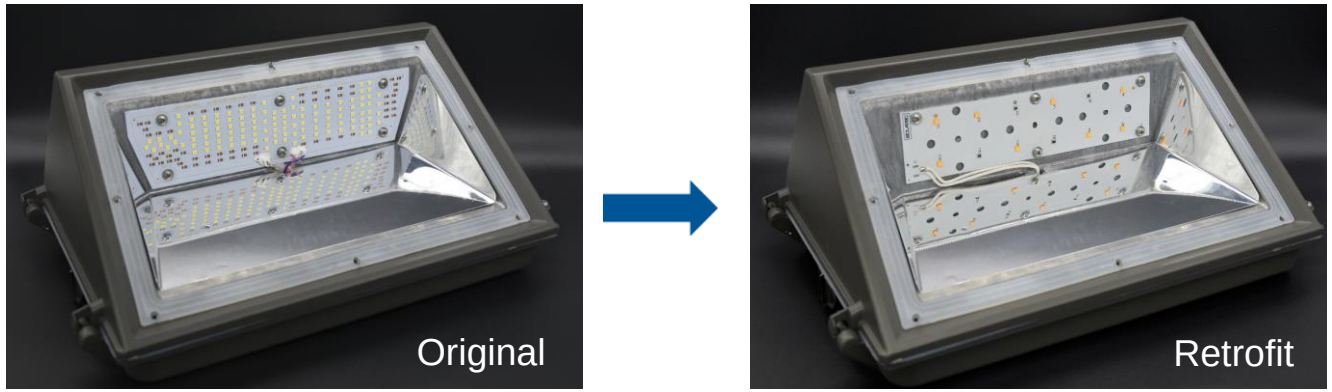


XP-G3 8-LED PCB used in the comparison

Fixture	Tcase (°C)	Current (A)	Voltage (V)	Power (W)	LumFlux	LPW	CCT (K)	CRI
HPS W/ lens	---	1.2	49.56	62.60	**2656**	**42**	1972	12
XP-G3 Retrofit W/ lens	**85**	1.2	23.50	28.20	**2630**	**93**	1953	**71**

Comparison – HPS Wall Pack vs Cree LED retrofit using LED Fixture

- Goals
  - Use an off-the-shelf LED-based wall pack fixture for more realistic comparison
  - Fixture body acts as heatsink, no need for parabolic reflector - plastic reflector bonded to inner walls

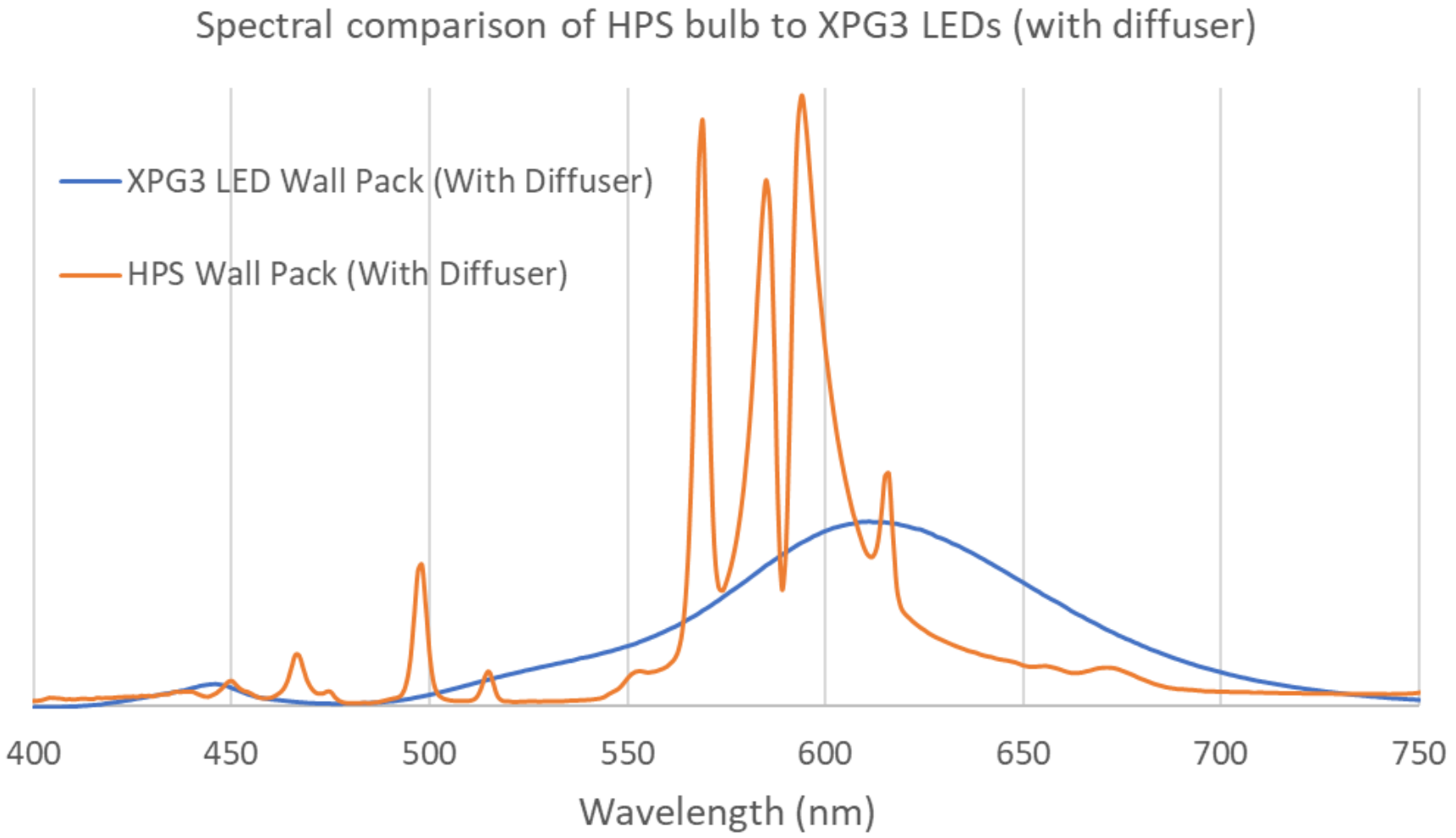


XP-G3 8-LED PCB used in this LED-based fixture retrofit

Fixture	Tcase (°C)	Current (A)	Voltage (V)	Power (W)	LumFlux	LPW	CCT (K)	CRI
HPS W/ lens	---	1.3	49.56	62.60	**2656**	**42**	1972	12
XP-G3 Retrofit @1.2A	**46**	1.2	24.1	28.9	**2624**	**91**	1942	**72**
XP-G3 Retrofit @1.5A	**52**	1.5	49.6	36.2	**3068**	**85**	1952	**72**

SPD Comparison & Blue Light Content Comparison

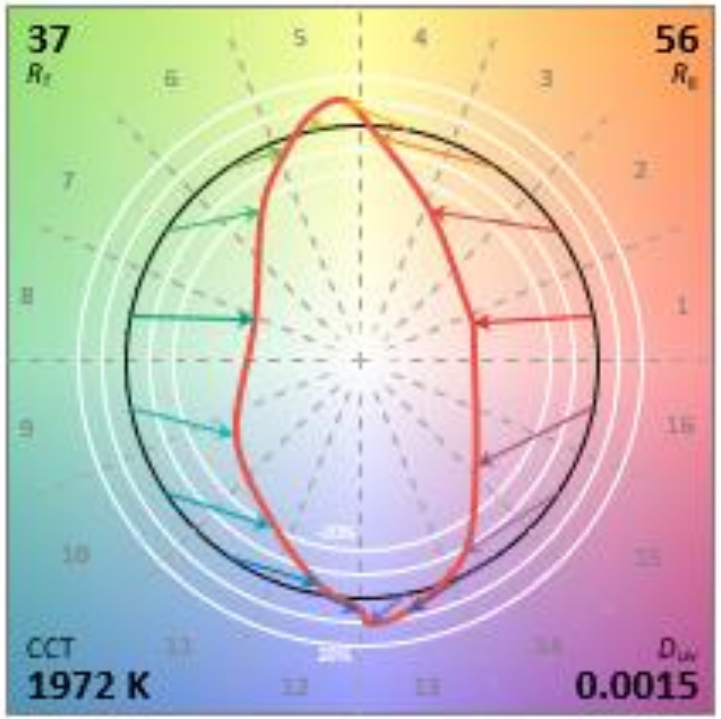
- XP-G3 1800K LED reduces blue spectral content (400nm-500nm) to almost half of HPS
  - HPS: 7.2%
  - LED: 3.8%



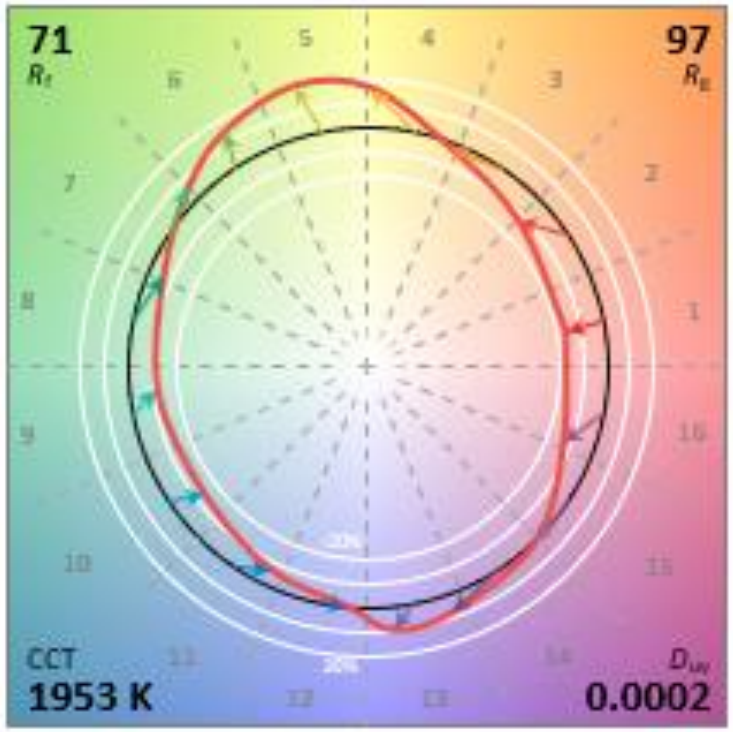
TM-30 Comparison

- The new 1800K LEDs give much more accurate color rendering as shown by the TM-30 vector graphics below

HPS



XP-G3 LED



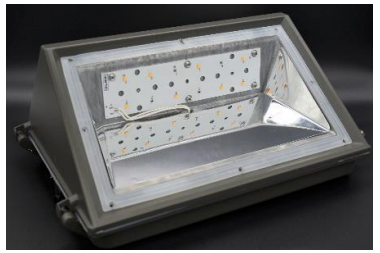
*does not fall into any P/V/F category

Application Photos – XP-G3 1800K Retrofit

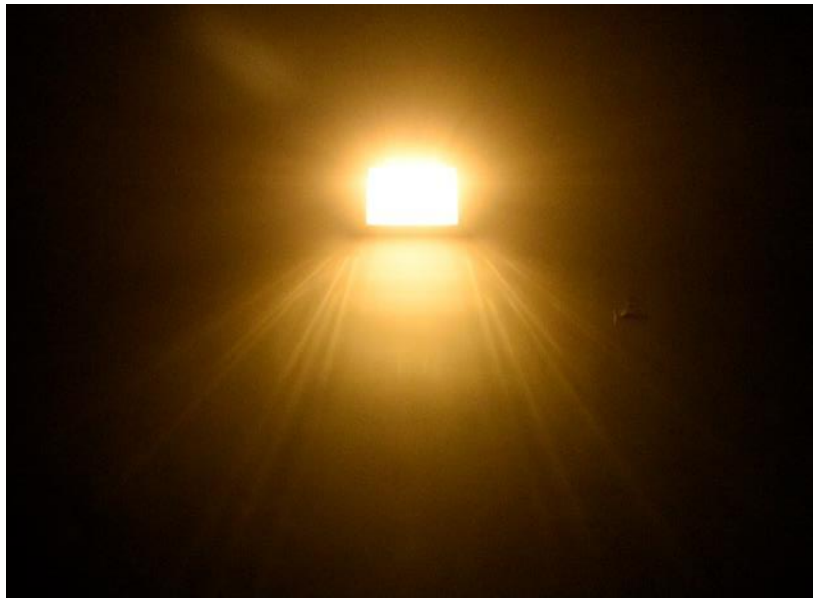
- Both retrofits show similar light patterns and matched color temperature
- Further design improvements could easily be made to diffuser to reduce striations

HPS
Original

LED
(HPS Housing)



LED
(LED Housing)



Results Summary

- LED based 2000K retrofit is 16% brighter at 1.5A with double the LPW
- Steady state system temperature is reduced significantly in LED solution
- CRI improved from 12 to 72
- HPS color point reached with lower blue LED content fitting for some applications
- Viable lighting alternative to HPS with upside performance benefits - better system cost, higher CRI, higher LPW and positive environmental impact.

Parts Lists & Specs

Parts List (Cree 8-LED PCB used in LED based retrofit)

Item	Description	P/N	QTY
Wall pack	OTS LED-based Wall pack fixture	WP03B-80W-277-50K-1PK	1
LED	XLamp® XP-G3 LED, 1800K	XPGDWT-01-00FBE	8
PCB	2W/mK	NA	1
TIM	Dow Corning Thermally Conductive Compound	TC-5622	1
Heatsink	N/A	N/A	0
Optic	Existing wall pack lens		1
Driver	Benchtop DC Supply	1.2 Amp CC Driver ~24V	1

HPS Specs

Metric	Details
Base	E26 Medium Screw
Bulb Type	High Intensity Discharge Bulbs (HID)
Lamp Finish	Clear
Luminous Flux (LM)	3600
Maximum Overall Length (in)	5.362
Diameter (in)	2.191
Rated Life (Hours)	24000 until 0% light?
Color Temp	2100K
Shape	Ellipsoidal ED17
Wattage (W)	50W
CA Prop 65	Yes
CA Prop 65 Material	Mercury