Introduction Overview

LED Lighting, At-A-Glance, Case Studies, Custom and Solar

PHILIPS

HADCO

sense and simplicity

Simply enhancing life with light

Since 1953, we've built our products to a superior standard of quality and craftsmanship, using only the finest raw materials and components available. We've also built our business to a superior standard of consistency and reliability.

We inspect every piece we manufacture, multiple times, for fit and finish. Each of our designs is precision engineered, backed by ISO 9001 Certification. And our comprehensive warranties exceed industry standards.

But that doesn't entirely explain how we became the industry leader. There's another important area where we excel.

Service.

Smart. Prompt. And flexible.

At Philips Hadco, it has to be – because we provide the broadest selection of styles, finishes, and lamping options in the industry. Our superior service helps you navigate the choices and ensures that you're getting just what you need. When you need it. Even if we have to custom design it.

When you light with Philips Hadco, you can rest assured it'll be done right. On time.

That's why more and more architects and designers depend on Philips Hadco. Because they know what they'll get. Satisfaction.

Contents

The Philips Lighting Difference

We believe in creating innovative outdoor solutions that beautify and inspire, while making people safer and more comfortable.

We believe that environmentally and socially sustainable lighting solutions improve the livability of our world's cities, while respecting the planet.

We believe that making outdoor spaces more sound, secure and engaging, enhances people's lives.

Who is PHILIPS?

As the global leader in lighting, Philips is spearheading innovative and environmentally progressive solutions for today's ever-changing demands.

For a century and counting, Philips has been one of the foremost providers of lighting technologies, enabling new and more efficient uses of light that can transform our world both visually and practically.

We're proud to be a global leader in sustainability. Philips strives toward the ideal of meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.

The Philips family of products delivers complete lighting solutions, from components and lamps to luminaires and integrated systems, providing you with quality, simplicity and innovation.

The Philips Hadco Story

Philips Hadco has been a leader in manufacturing high-performance, exceptional quality lighting products for over 50 years. Philips Hadco serves the Municipal/Utility, Commercial and Residential lighting markets. Our lean, made-to-order philosophy and commitment to providing the lighting industry's shortest lead times allows us to consistently meet our customers' needs. Philips Hadco specializes in custom and modified products and utilizes the latest technologies available.

The Total Philips System

By leveraging the global strength of Philips, we believe Philips Hadco can offer the most vertically integrated product from conception to final assembly including LEDs, platform designs, electronic drivers, and controls.

It is with this One-Philips philosophy that we can ensure our customers will receive the world class products and quality expected, and that these products will outlive those of our competitors.

And, we know you will not find another global company such as Philips with over a century of experience in producing quality lighting products to give you confidence in our designs.

Made In America

Together, we can support your business and help build a stronger American economy. Philips Hadco is positioned to:

- Continue to expand our environmental corporate efforts in order to create a more sustainable future.
- Further our research and development activities to produce the most innovative products available.
- Sustain our business in America by supporting American investments, along with workers and their families.

Reliability

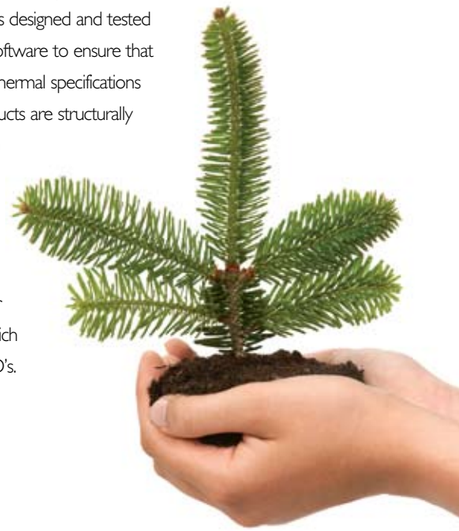
All Philips Hadco products are designed and manufactured to the very highest of quality standards in order to create the most reliable lighting products available on the market.

Our engineering and manufacturing facility located in South Central Pennsylvania is fully equipped with state-of-the art equipment including:

- Photogoniometer
- Hot and cold test chambers
- CNC machine center
- Aluminum foundry
- Ingress protection (IP) testing
- Accelerated aging and UV testing
- Powder-coat paint finish system

Innovation

Philips Hadco's design team utilizes the latest innovations in engineering software to develop all of our new products. Every product is designed and tested first with 3-dimensional software to ensure that the LED manufacturer's thermal specifications will be met and the products are structurally sound prior to tooling up for production. Not only does this improve speed-to-market, but it also allows engineers to create optimal designs for thermal management which is critical to the life of LED's.



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PHILIPS HADCO

LED Lighting

What is an LED?

Simply put, an LED or Light Emitting Diode is an LED chip on a sub-mount that is packaged with electrical connections, a thermally conductive path and a protective lens. When current flows across the junction of the two different materials, light is produced from within the solid crystal chip. Philips Hadco uses high-brightness white LEDs that are created by coating a blue LED chip with a phosphor, which generates a white color.

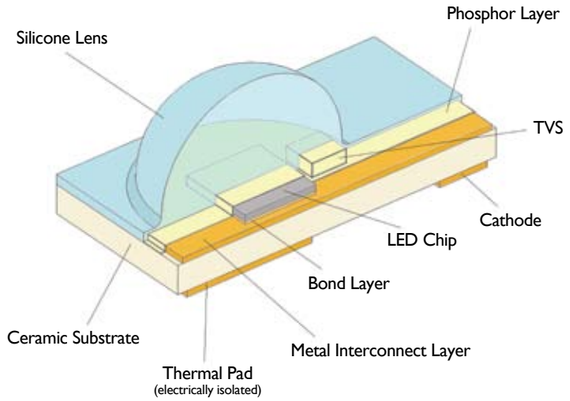
Why LED?

Energy Savings

Saving energy is an important factor for many communities and decision makers. LED lighting offers one of the highest energy savings of any lighting source on the market. In comparison to high–intensity discharge (HID) lamps, LED luminaires could save up to 50% in energy consumption.

Sustainability

What does Green really mean? Many think of it in terms of the degree to which we are preserving our planet. One way to accomplish this is to reduce our "carbon footprint". The carbon footprint is thought of as the amount of carbon dioxide (CO^2) and green house gases released into the atmosphere by human activity or a product lifecycle. By switching to LED, the amount of CO^2 emitted is drastically reduced. In addition, since LEDs are mercury-free and contain no hazardous materials they are environmentally safe and recyclable.



LED Basics

LED lighting is a paradigm shift in the outdoor lighting industry. An LED or Light Emitting Diode is a digital solid-state lighting component that does not need electrical filaments or gas to produce light. The result is a cool (in the beam), energy-efficient and reliable light source that provides at least 70,000 hours of crisp white illumination without the need for lamp maintenance.

How Light is Created

When sufficient voltage is applied to the LED's semi-conductor chip, current flows and the electrons cross into the junction from the "N" region while holes cross into the junction from the "P" region (see diagram). The attraction of electrons to holes causes recombination. When the electrons recombine with the holes, electromagnetic energy is released as photons – what we see as visible light. The material of the chip and the phosphor used to create white light determines the wavelength of this energy.

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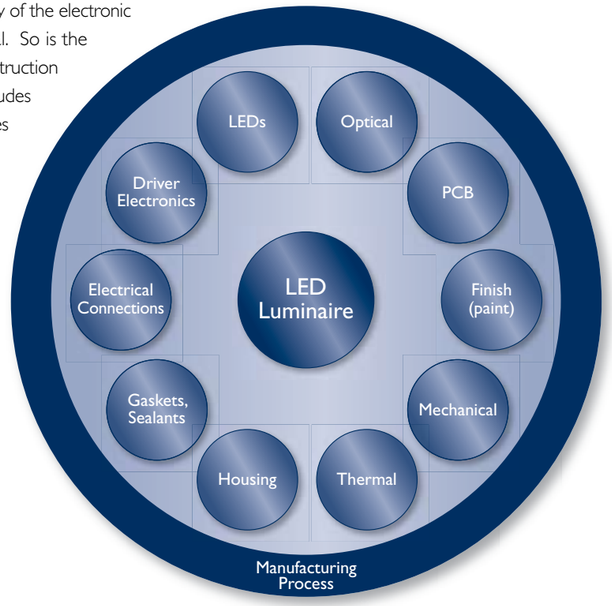
LED Luminaire System Reliability

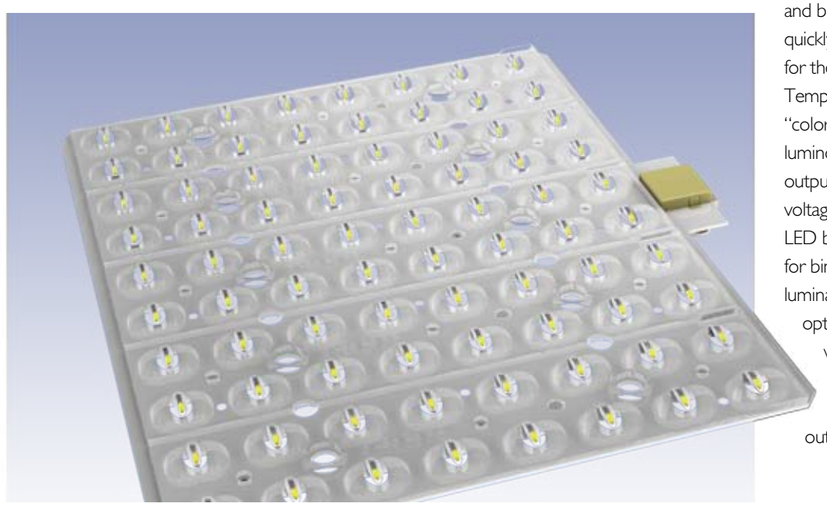
LED luminaires are complex digital systems. Reliability of the electronic components – the LEDs and the drivers – is crucial. So is the reliability of the other components used in the construction of LED luminaires. Overall system reliability also includes consideration of manufacturing and assembly processes (see diagram). The manufacture of the components themselves, soldering LEDs to PCBs, thermally and mechanically constructing thermal management sub-systems, and mechanical assembly from sub-assemblies to the final product are also key factors. Lastly, designing for varying operating environments – including ambient temperatures as well as moisture and dust intrusion - also contributes to the long reliable lifetime of LED luminaires.



Binning for Peak Performance and Consistency

Unlike traditional sources that use gas, LEDs are a solid state lighting source which means they produce light from a solid. The result is a continuous spectrum of light that enables better color rendering across the entire spectrum from cooler blues to neutral greens and yellows to warmer reds.

Starting with a substrate, LED chips are created by depositing layers. While this is a controlled process manufacturing tolerances still remain. Therefore, LEDs are evaluated and grouped in a process called binning. LED manufacturing is a high-speed process and no heat sinks are used so testing and binning occurs very quickly. LEDs are binned for their Correlated Color Temperature (CCT, or "color") as well as their luminous flux (or "light output") and forward voltage (Vf). We specify LED bins and account for binning in our LED luminaire design to ensure optimum performance while maintaining the consistency required for outdoor illumination.



Design for LED Luminaires is Critical

In addition to binning, long-term LED luminaire performance is also designed in. Validation of the entire luminaire system design is critical to ensure that the LED manufacturer's junction temperature limit and the driver manufacturer's case temperature limit are not exceeded.

Without proper thermal management, the promises of a long useful life (L70) and delivered lumens from an LED luminaire cannot be achieved and premature failure is eminent. We address these important aspects with innovative heat sinking and thermal management, designs that have been thoroughly tested ensuring the most reliable LED luminaire system available.

Benefits of good quality white light

1 White light creates atmosphere and makes our towns look more friendly and lively, and architecture more authentic.

1 - Source: Chairman of Somusaguas Neighborhood Association, Madrid, Spain.

2 White light makes streets feel safer – Drivers can recognize movements on the edge of the road earlier, and from greater distance, giving them more time to react.

2 - Source: Lighting Research Center.

3 White light contributes to a social feeling of safety and prevention of crime as it allows people to recognize faces and colors more easily. >80% feel safer with white light.

3 - Source: Administrative Board Neath Port Talbot, Wales, Great Britain.

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At-A-Glance

Whether looking to revitalize economic growth and commerce, increase security in a specific area, or design an enjoyable outdoor space, Philips Hadco is the clear choice. Municipalities must think about more than just aesthetic appeal when selecting luminaires and site amenities. A sound investment, simple maintenance and good quality that lasts are equally as important. Philips Hadco's line of products speaks to all of those concerns.

PA2

PA31

PA4

PA5

RX1

RX2

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C52


CL32/CL52


CS105


G35


G63


R52


RL32/RL52


R34/R54


RL34/RL54


R65


R73/R75


T03


TN3/TN4/TN5


TT3/TT4/TT5


TW3/TW4/TW5


UX1


V022


V031


V092


V1503


V151


VL151


V152


VL152


V1547


V21


V25


V2702


V2703


V4800


V600


V602


V651


V671


V681


V70


V71


V72


V8911


V8915

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CF11/CF12

CF14/CF15

CF17/CF18

CF2

CF4

CF5

CF6

CF7

CF71

CF72

T14

T20

TF2

TF3

TF5

TF8

TF9

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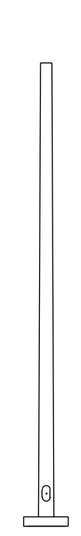
Poles At-A-Glance



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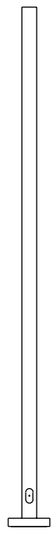

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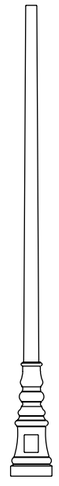

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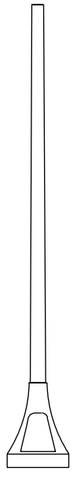

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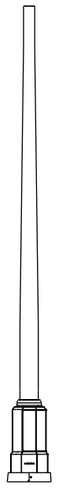
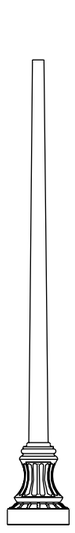


P1700 Series

P1900 Series



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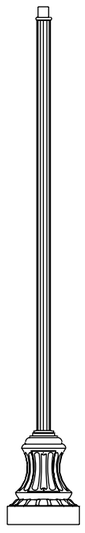

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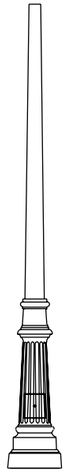

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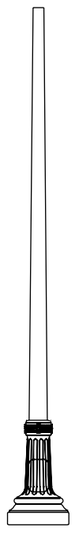

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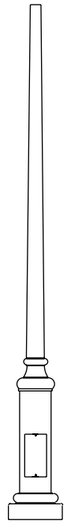

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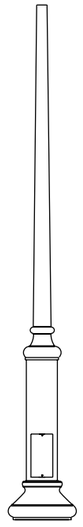

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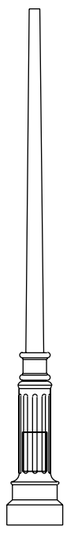
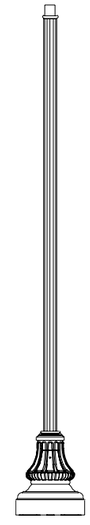


P4400 Series

Poles and Bases At-A-Glance

P5000 Series



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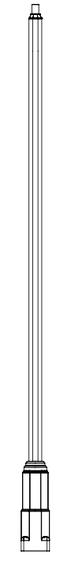

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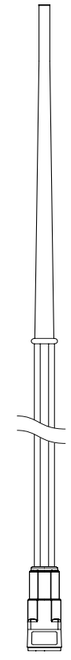

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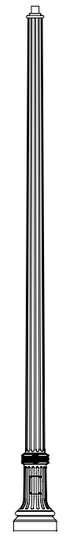
P9000 Series



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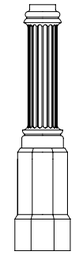

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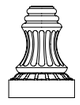

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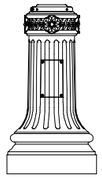

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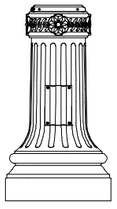

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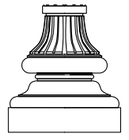

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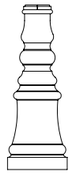

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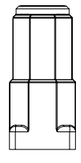

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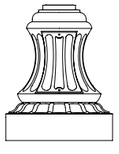

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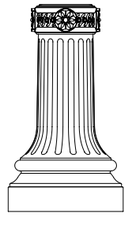

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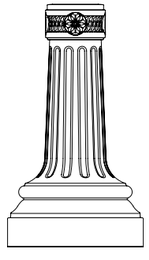

WAB3300

WAB5000

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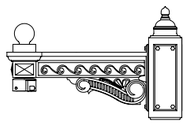

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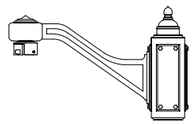

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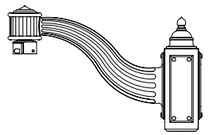

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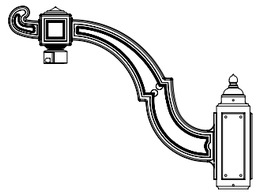

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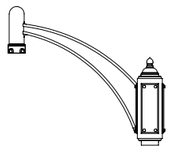

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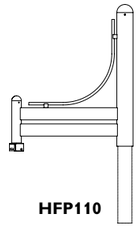

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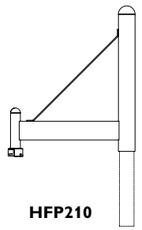

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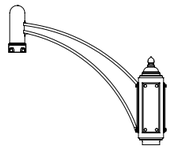

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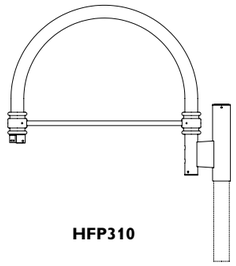

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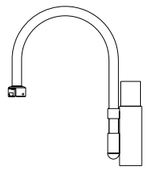

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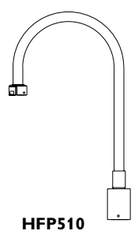

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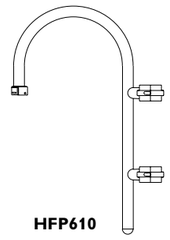

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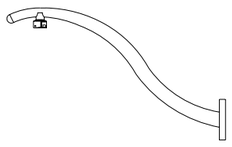

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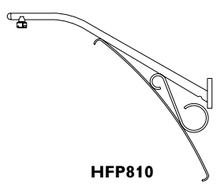

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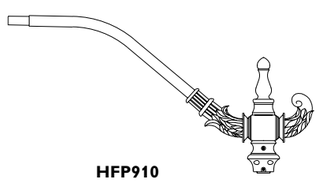

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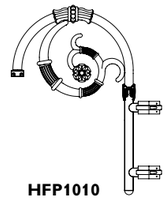

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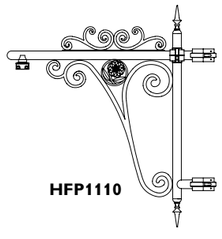

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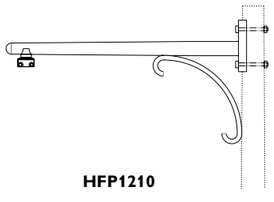

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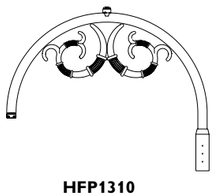

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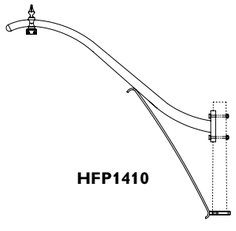

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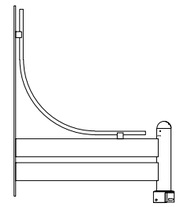

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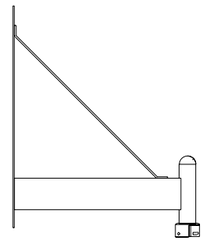

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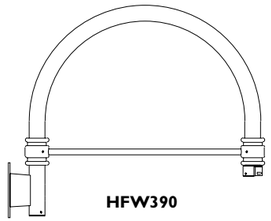

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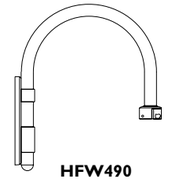

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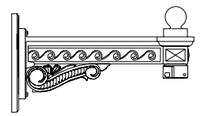

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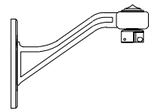

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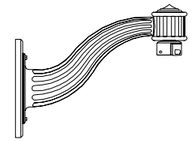

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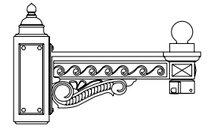

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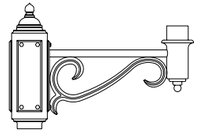

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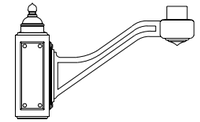

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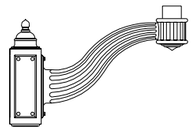

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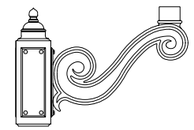

PTH2510

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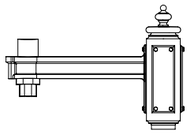
Arms At-A-Glance



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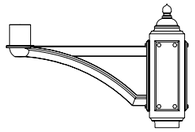

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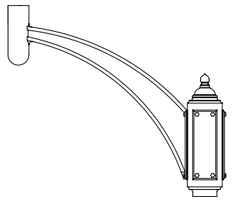

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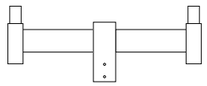

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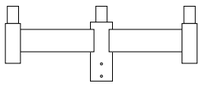

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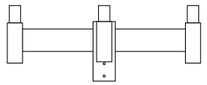

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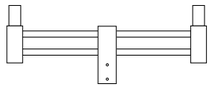

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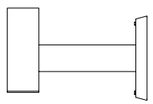

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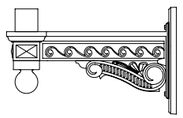

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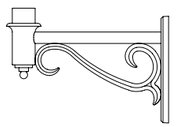

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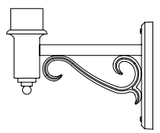

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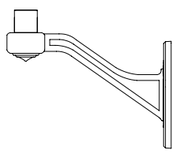

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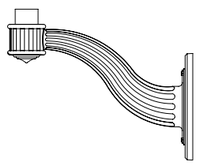

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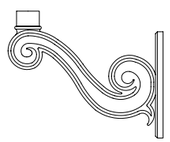

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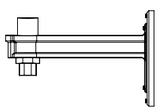

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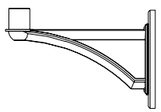

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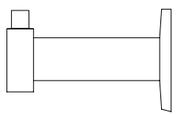

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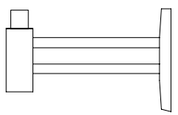
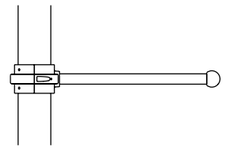
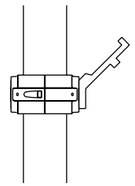


PTW3180

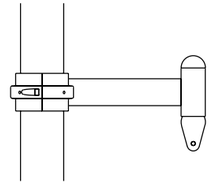
Accessories / Landscape Lighting At-A-Glance



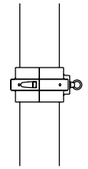
BA
Banner Arm Bracket



FHB
Flag Holder Bracket



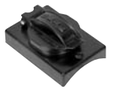
FPB
Flower Pot Bracket



TD
Tie Down Bracket

M0004
Button Eye Photocell

M0005
Button Eye Photocell



M0006
Receptacle

M0007
Receptacle

M00012
Ladder Rest

M0080
Pier Base

M0090
Post Adapter

Specification Grade
Landscape Lighting

Please refer to the "Specification Grade Landscape Lighting" catalog for all of Philips Hadco's offerings in this area.

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PHILIPS HADCO

Materials and Finishes

We send our products into punishing environments with confidence, because we build them ... with the most rugged, high-performance materials available.

Alloys

We supply our proprietary aluminum ingots to our suppliers to keep a close eye on quality control and traceability. Our Philips Hadco-exclusive, low-copper alloys feature superior corrosion resistance, strength, weldability, and ductility. Formulated to resist oxidation, improve paint adhesion, and maximize performance.

Surfaces

We pre-treat every one of our fixtures with a five-stage cleaning process and we shot blast our poles and bases. These processes remove oxides and guarantee a uniform surface – creating a powerful bond between metal and paint that resists abuse, weather, and the effects of age.

Rigorous Testing

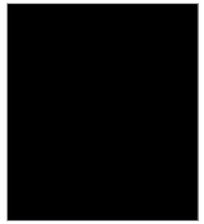
We put our materials up against the industry's most challenging testing standards. And even under thoroughly abusive conditions – from accelerated weathering, to salt-spray testing – our products retain their strength and durability.

TGIC Thermoset Polyester Powdercoat Paint and Finish

We electrostatically apply our resilient TGIC thermoset polyester powdercoat paint to every fixture. Specially formulated for Philips Hadco, it provides extended gloss retention, U.V. protection, and the highest temperature rating in the industry. In addition to the standard color choices shown, a spectrum of custom colors is available. Call or visit our website for more details.

Marine Grade Finishes Also Available

For fixtures and poles susceptible to the most extreme elements – salt, ocean water, or strong winds – our marine-grade finish guarantees extra protection against corrosion. We apply an epoxy primer undercoat to provide maximum bonding for adhesion with the top-color coat. Consult factory for more detail.



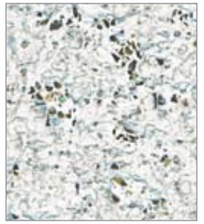
A = Black

B = White

H = Bronze

I = Gray

J = Green



L = Limestone

V = Verde

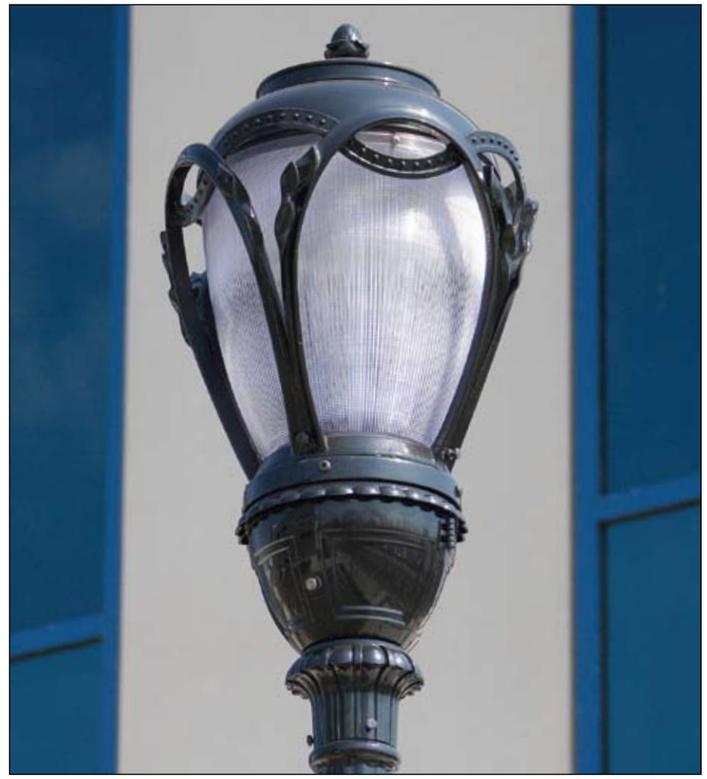
S = Sandstone

J = Green

B = White

H = Bronze

L = Limestone



A = Black

V = Verde

S = Sandstone

I = Gray

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Optics

Performance

Our dedication to using only state-of-the-art, precision optics means you can plan projects efficiently–knowing you'll get just the results you need without extra fixtures, extra expense, or wasted light. With our wide variety of superior lamp options, ballasts, and controls–along with innovations like pulse-start metal halide, high-wattage compact fluorescent, LED and long-lasting induction lamps–Philips Hadco optics maximize your high-performance options while minimizing long-term operating costs.

Dark Sky Recommendations

With precise lighting products, specifications and controls, we give lighting designers and contractors the tools they need to follow industry best practices – to conserve energy, address safety concerns, and preserve the natural light environment.

BUG Rating

BUG or Backlight, Uplight and Glare Ratings
(based upon maximum zonal lumens)

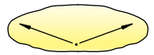
- **B** Backlight 0°- 80° BL, BM and BH zones.
- **U** Uplight 80° forward light up and over the top of the fixture to 80° backlight in the UL, UH, FVH and BVH zones.
- **G** Glare is downward light from 80° forward down and under the fixture to 80° backlight in the FH, FVH, BH and BVH zones.

Optical Assembly Types

Each fixture in this book has an **Optical Assembly** specification, which lets you know which "Type" optics are available for that fixture.

As you consider your options, think about what type of illumination you want your fixture to provide. Should the light go in all directions, or in a specific area? Are you lighting a large parking lot, or a narrow bike path?

The following illustrations show a bird's-eye view of the approximate photometric pattern you can expect from each optical assembly type.



Type I

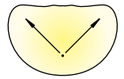
Recommended Application:
Narrow walkways or bike paths.

Recommended Placement:
At or near center of pathways.

Type II

Recommended Application:
Wider walkways, entrance roadways, bike paths and other long and narrow lighting applications.

Recommended Placement:
Near the side of roadways.



Type III

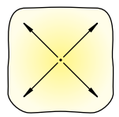
Recommended Application:
Roadways, general parking areas, and other area lighting applications.

Recommended Placement:
Near the side of the lit area.

Type IV

Recommended Application:
Wall mounting applications. Illuminating the perimeter of parking areas.

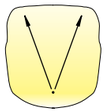
Recommended Placement:
Near the side of the lit area.



Type V

Recommended Application:
General parking and area lighting applications.

Recommended Placement:
At or near the center of an intersection or in a large area.



Forward Throw

Recommended Application:
Perimeter lighting applications for sharp house-side cutoff and minimal spill light.

Recommended Placement:
At the building perimeter.

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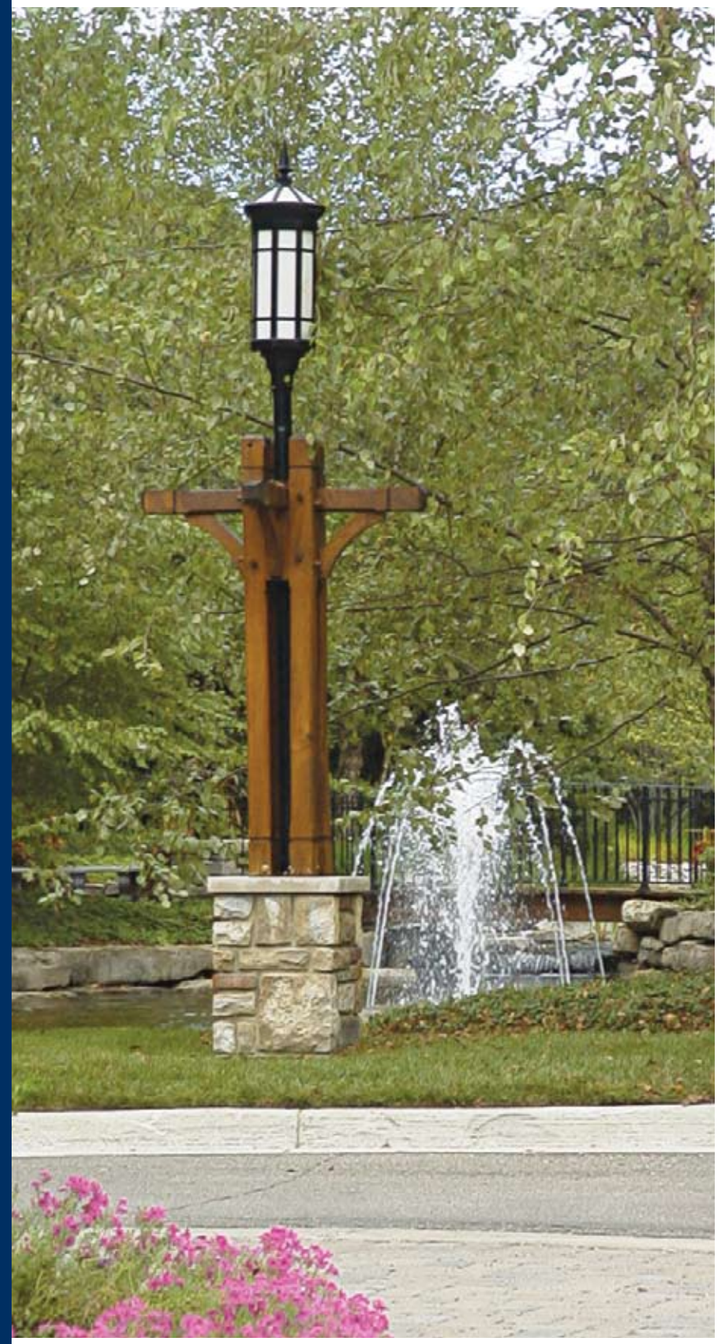
Photo Gallery

Function and Versitility

The following images demonstrate the function and versatility of Philips Hadco lighting fixtures, arms and poles. They show your creations doing what they do best – blending into design and enhancing their environment.

The Traditional Post-Top installation at right shows an effective approach to providing safety and function – using a daytime profile that harmonizes with its surroundings, with an optically correct nighttime presence that won't overwhelm the atmosphere with wasted light.



Shown: Citadel V25

Properly placed post-top fixtures provide much more than embellishment; they also serve as beacons to direct visitors to main points of entry.

Shown: New Oxford V022, Pole P2165

In the types of high-traffic locations traditionally lit with cobraheads, our Teardrop fixtures offer an affordable alternative... adding character.

Shown: Teardrop TF1

Consider our Traditional Post-Top fixtures for duty around public-accessible rooftop areas that require lighting for safety; these areas present a perfect opportunity to accent architecture.

Shown: Mini Hagerstown V031

Our wide variety of Teardrops and Bollards allows you to create your own ensemble – a hardworking, easy-to-maintain system that provides security while accenting its environment.

Shown: Teardrop TF3, Pole P195, Arm HFP510 and Bollard CF73

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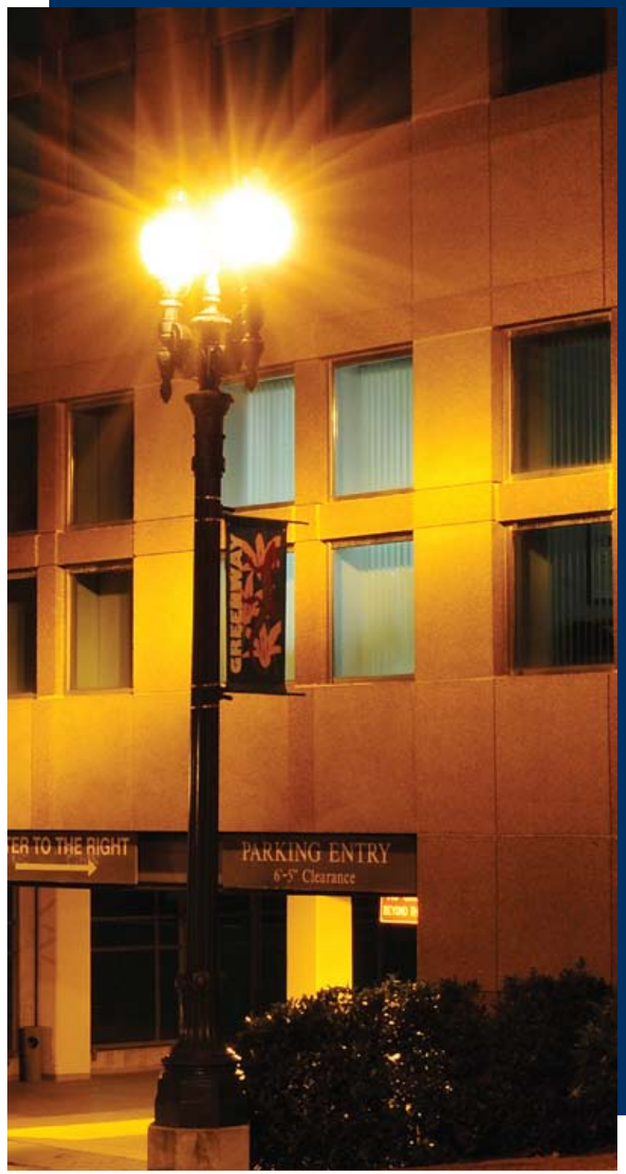
Our array of options to customize traditional post top installations allows you to improve illumination and signage without compromising aesthetics.

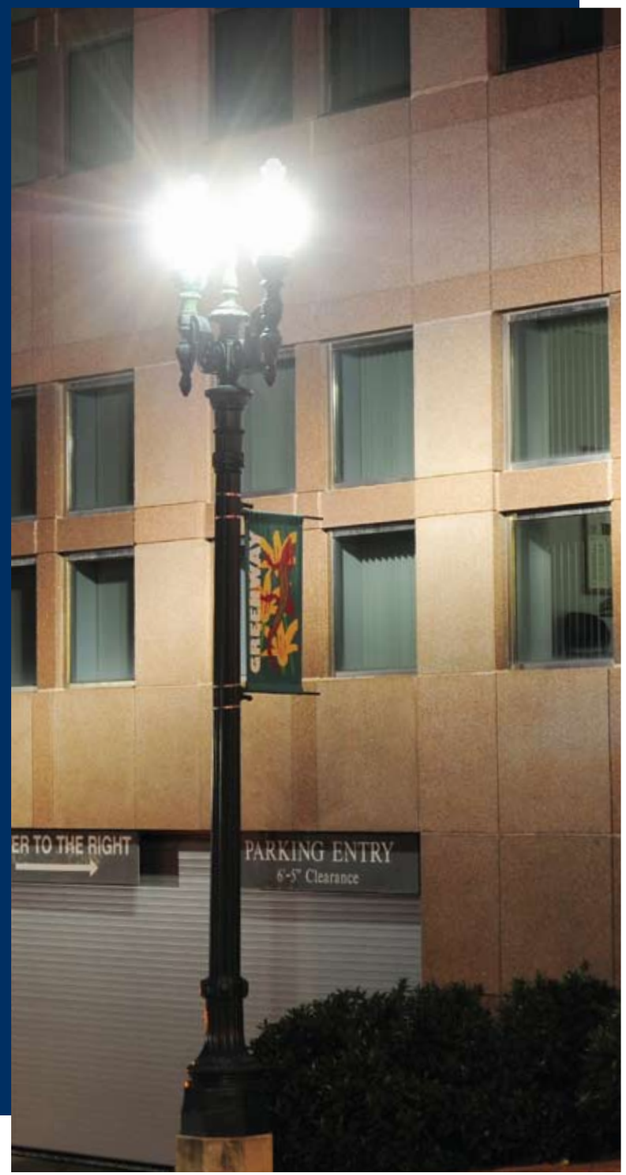
Shown: V8915

A full line of wall mount brackets and arm brackets is available to keep a common theme across an entire application.



HID technology requires multiple re-lampings, has a poor CRI, a longer warm-up time and a shorter life than LED.

Shown: RL54 HID



LED technology is proven to be more energy efficient and have a much longer life vs HID. LED allows for lower maintenance costs, higher CRI, crisp white light, instant on and off.

Shown: RL54 LED

Photo Gallery

Introduction Overview

Our custom engineering department can help you create unique designs that fit your specific application requirements.

Shown: Teardrop TF9 with custom mounting

In the types of high-traffic locations traditionally lit with cobraheads, our Teardrop fixtures offer an affordable alternative.

Shown: Teardrop TF9

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"We are seeing such significant savings, and not losing any level of safety or comfort."

Chris Butler, Management Specialist City of New Brunswick New Jersey

New Brunswick, New Jersey

Client
New Brunswick, New Jersey

Project
George Street Streetscape

Location
New Brunswick, New Jersey

Luminaires
Philips Hadco's LumiLock LED Refractive Globe

Light Source
LED

Lighting Support
Philips Hadco, Dave Murphy & Associates

Photo Credit
Brett Drury

Background

The City of New Brunswick, considering the revitalization of their streetscape lighting, began to evaluate energy efficient products. As part of that process, they explored their streetlight inventory (approximately 3,000 lights) paid for on a non-metered system through PSE&G. At the same time, the City received a Middlesex County Sustainability Grant and wanted to capitalize on the opportunity the grant could help deliver. Their thoughts were squarely focused on an environmentally sustainable, fiscally responsible solution for the future.

The Challenges (the opportunity)

Lighting technology was progressing rapidly and there was a lack of detailed specifications and standards for LED streetlights – city leaders knew that research and testing would be needed and that it would be an uphill battle. The complexity was heightened as they began to evaluate roadway (cobra-head) and decorative options which were at different phases of documentation. The central goal was to maintain light levels and reduce energy consumption.

The Solution

After deciding to focus initially on their George Street streetscape, the City determined that the Philips Hadco LumiLock LED post top was a perfect fit for this decorative project. Fully tested and complete with photometric and detailed specifications, Philips Hadco proved easy to work with.

The Benefits

The LumiLock LED post top enabled the City of New Brunswick to convert 175W MH twin mounts to a single mount LED solution – saving more than 50% cost per pole (energy and maintenance). Chris Butler, Management Specialist, City of New Brunswick said "we are seeing such significant savings, and not losing any level of safety or comfort". The city is very pleased with the quality of the crisp white light.

Through the George Street project, the City of New Brunswick is enjoying not only significant cost savings, but have the peace of mind that this single project phase is eliminating annual carbon emissions equivalent to 40,250 pounds (20 tons) of carbon dioxide out of the atmosphere. Further, the only complaint they have received thus far is from a local business that is frustrated that they have to wait until the next phase for their block's lights to be replaced.

"Going to LED was a no-brainer. It is a great thing to deliver useful, uniform light in a public space that is not overwhelming, providing our park visitors with a sense of safety and environmental sustainability. And, we could achieve all this while saving energy and maintenance costs at the same time."

Senior Project Coordinator, John Biale

Overpeck Park, New Jersey

Client
Neglia Engineering & Bergen County, NJ

Project
Overpeck County Park

Location
Bergen County, New Jersey

Luminaires
Philips Hadco's LumiLock LED Refractive Globe

Light Source
LED

Lighting Support
Philips Hadco, Dave Murphy & Associates

Photo Credit
Brett Drury

Background

Overpeck County Park, located in Bergen County New Jersey, spans several hundred acres of donated land from parts of neighboring Leonia, Palisades Park, Ridgefield Park, and Teaneck. The dream of creating a central recreational and cultural haven was more than 50 years in the making and only recently realized. A landfill as late as the mid-1970s, it is now as of September 2009, a family destination.

The Challenges (the opportunity)

Use of Overpeck Park would be variable and dynamic – a home to football, baseball and soccer fields, an equestrian center, walking trails, recreational areas, parking lots and a community entertainment venue. Several events may be happening one night, while only the walking trails would be used the next night. This posed a complex lighting challenge, with a single solution required to illuminate the park to current standards while achieving significant energy and maintenance cost savings. John Biale, Senior Project Manager, needed to ensure that the selected light fixtures not only could be controlled and achieve the necessary efficiency targets and cost savings, but would also be aesthetically pleasing as an extension of the natural beauty of the park.

The Solution

Philips Hadco's Lumilock LED Refractive Globes were chosen for their decorative appeal, as well as modular features and benefits. The luminaires are powered through several circuits, leveraging LED's exceptional manageability. Further, this manageability allowed several areas within the park to be turned off when not needed. John said "Going to LED was a no-brainer. It is a great thing to deliver useful, uniform light in a public space that is not overwhelming, providing our park visitors with a sense of safety and environmental sustainability. And, we could achieve all this while saving energy and maintenance costs at the same time". Philips Hadco performance, reliability, warranty and dedicated solution providers were all key components of the decision.

The Benefits

Reclaimed from a former landfill, Overpeck County Park is a vast greenspace in the heart of one of the most urban and densely populated states in the US. John mentioned that the people of Bergen County enjoy this park and the lighting is a big part of that experience. "I have received several emails from people who tell me how great this park is and how they feel very safe on the walking trails." John would like to see all of the future lighting systems within his parks use LED lighting so they too could benefit from the same energy and maintenance savings as Overpeck Park.

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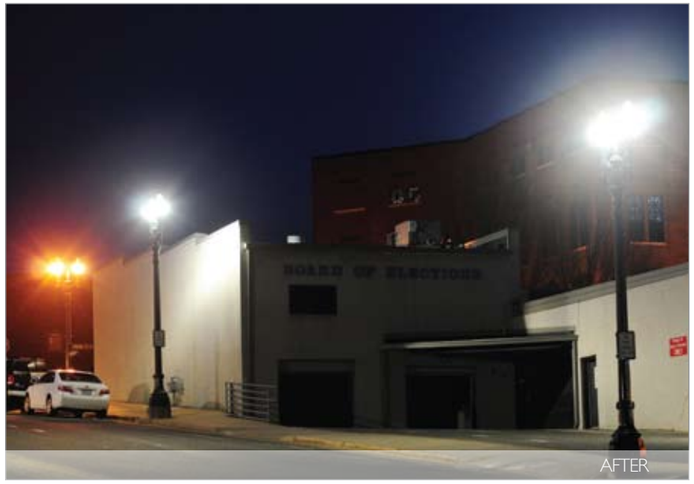
"The installation of all 74 fixtures proved to be very simple and was completed in half the time expected. The lighting levels and uniformity have met or exceeded our initial expectations, while receiving many positive reviews. As the City of Concord advances it's "Green Initiatives" we will continue to seek out quality products, such as the Philips Hadco LED fixture, to help us reach our environmental and energy cost containment goals."

City of Concord NC Electrical Systems Manager, Scott Chunn

Concord, North Carolina



Client
City of Concord, North Carolina

Project
Retrofit from HPS to LED

Location
Concord, North Carolina

Luminaires
Philips Hadco's LumiLock Engine

Light Source
LED

Lighting Effect
LED Decorative Lighting

Lighting Support
Philips Hadco, Pete Glass & Associates

Background

The City of Concord decided it was time to upgrade to LED lighting and modernize the city. Eager to replace the HID lamping modules installed in1990, the city applied for and received a government grant to fund the project

The Challenges (the opportunity)

One challenge was to increase efficiency and light levels without having to add additional fixtures and poles. This is one of the main reasons Concord decided to use the Philips Hadco LumiLock LED engine. This engine was designed to work in existing Hadco Refractive Globes and would not require the city to install any additional fixtures. The city was able to meet and exceed light level and uniformity requirements with this LED engine.

The Solution

The retrofit was simple. Philips Hadco LumiLock LED Engines were installed resulting in 54% energy savings. The longer rated life of LEDs will also save the city money on lamps and maintenance costs to re-lamp. The city looks forward to further expanding their retrofit project at a later date. Using less energy, saving on maintenance and gaining a longer life demonstrates that the City of Concord is moving forward with sustainable technology and confidently looks towards a brighter future with LED lighting.

The Benefits

Scott Chunn, Electrical Systems Manager for the City of Concord, said that as the City of Concord progresses in their efforts to reduce energy cost, as well as to reduce their own enviornmental impact, they are continually looking for innovative, cost effective solutions to implement. "The initial project in solid state lighting involved a retrofit of 150W HPS post top fixtures. These fixtures had been in service for approximately 15 years as part of a downtown streetscape project." The city chose Philips Hadco's LED LumiLock engine to retrofit the existing Philips Hadco Refractive Globe fixtures. "This installation proved to be very simple and was completed in half the time expected. The lighting levels and uniformity have met or exceeded our initial expectations, while receiving many positive reviews. As the City of Concord advances it's "Green Initiatives" we will continue to seek out quality products, such as the Philips Hadco LumiLock LED Engine, to help us reach our environmental and energy cost containment goals."

"Our community came together to move forward and we are so proud of the work of our great team. The Business Improvement District leaders and the entire community have been supportive from the beginning."

Mayor of Pompton Lakes, Katie Cole

Pompton Lakes, New Jersey

Client
Borough of Pompton Lakes, New Jersey

Project
Downtown Streetscape

Location
Pompton Lakes, New Jersey

Luminaires and Controls
Philips Hadco's LumiLock LED Refractive Globe

Light Source
LED

Lighting Effect
LED Decorative Street Lighting

Lighting Support
Philips Hadco, Dave Murphy & Associates

Background

The Borough of Pompton Lakes, New Jersey, known for its country beauty, committed itself to being environmentally and fiscally conscious. Understanding it was time to make an investment in their historic downtown, and that lighting would play a major, visible role in the redevelopment plan, the Borough desired an environmentally sustainable solution. Collaborating with local businesses within the Business Improvement District to offset some initial investment, Vito Gadaleta, Borough Administrator, embarked on a journey that would satisfy the need for an aesthetically pleasing, unique downtown streetscape while delivering a fiscally sound lighting solution.

The Challenges (the opportunity)

Create a lighting solution that is: 1) historically relevant, 2) aesthetically appealing and 3) fiscally responsible, while: maintaining or improving current light levels, significantly reducing energy usage and costs, increasing maintenance efficiency (lowering maintenance costs) over the long run and reflecting the community's desire to be environmentally conscious.

The Solution

After much evaluation, the Lumilock LED Refractive Globe Luminaire by Philips Hadco was the clear choice. The LED engine and the refractive globe provided superior lighting characteristics, while the quality craftsmanship of the luminaire satisfied the aesthetic and historic needs. The modular construction allowed for customization, thus creating a unique solution that met the maintenance challenges. Philips Hadco performance, reliability, warranty and dedicated solution providers were all key components of the decision.

The Benefits

With the Philips Hadco solution, The Borough of Pompton Lakes will enjoy energy savings of nearly 50 percent and an estimated reduction of future maintenance costs of nearly 75 percent – all with a responsive nod to the community's passion for embracing and, in fact, being leaders in green technology deployment. Vito Gadaleta, sensitive to balancing up front investment and ongoing operating costs, says "A complex project like the Downtown Streetscape must be responsibly designed for the future, while considering current fiscal constraints and the needs of the community".

According to Mayor Katie Cole and Administrator Vito Gadaleta, local businesses are already seeing the benefits of the investment. The downtown businesses have begun to expand hours of operation and improve their own storefronts consistent with the new streetscape. Additionally, local residents are commenting that the light seems brighter and crisper while local officials are realizing reduced energy and maintenance costs. The streetlight, now a town standard, is also being used in a local park. In fact, other towns are beginning to look to Pompton Lakes as an example of environmentally sustainable advancement. Mayor Katie Cole mentioned that as you drive down the street you will now see people enjoying dinner at outdoor tables and walking around and shopping at night because it feels safe. "Our community came together to move forward and we are so proud of the work of our great team. The Business Improvement District leaders and the entire community have been supportive from the beginning".

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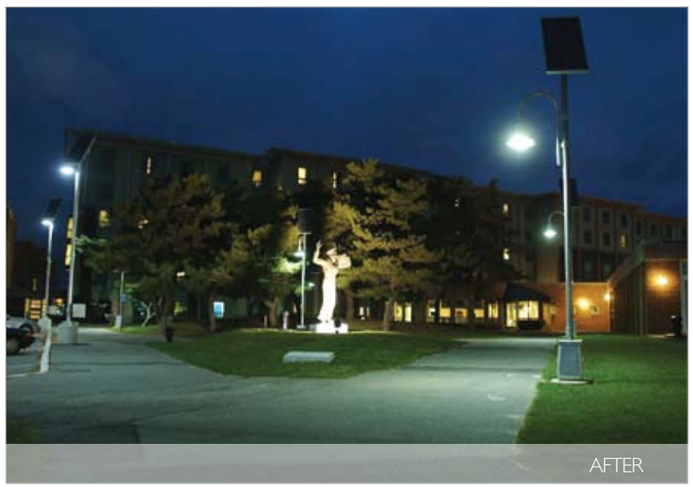
PHILIPS HADCO

"LED lighting feels more natural and appealing than yellow an orange sodium lighting. SolarOne® Solutions combines the best of both worlds; beautiful LED lighting and photovoltaic solar power by employing a unique management system to control both for maximum efficiency and reliability"

SolarOne® Solutions President, Moneer Azzam

Mass. Maritime Academy, MA


BEFORE


AFTER

Client
Massachusetts Maritime Academy

Project
Largest Array of Solar-Powered Outdoor Streetlights in New England

Location
Buzzards Bay, Massachusetts

Luminaires and Controls
Philips Hadco's Solar/LED Fixtures & Technology

Light Source
Solar/LED

Lighting Effect
Solar LED Decorative Lighting

Lighting Support
Philips Hadco, Solar One

Background

The lights, provided by SolarOne® and Philips Hadco, are powered by photovoltaic (PV) panels, making them completely independent of the electric grid. With their own solar power source, the light posts can easily be installed wherever light is needed, without expensive investments in trenching, cabling and repaving.

The Challenges (the opportunity)

The lighting project was largely funded by a $325,000 state renewable energy grant to Mass Maritime, supplemented by a $34,000 rebate from the Commonwealth Solar program managed by the Mass Technology Collaborative. The balance of the funding was provided by the Massachusetts State College Building Authority and other Mass Maritime funds. Ming-Jay Shiao of Solar Design Associates was the Specifying Engineer who advised the school to employ the SolarOne® Solutions light fixtures. Gregg Conboy of Erland Construction was the General Contractor for the project and said that setting the fixtures in place was straightforward. Architect Erika DeRoche, PCA of Prellwitz Chilinski Associates was instrumental in the overall campus lighting design.

The Solution

The new lights replace an old assortment of low pressure sodium fixtures and overbearing flood lights, the combination of which left the campus spotty, dark and poorly lit. Instead of adding safety, the old lighting created isolated pools of glare between dark areas. With no underground power conduits, the easily installed PV-powered lights were readily and economically placed along walkways and around the dormitories, which previously had no site lighting. The new solar-powered LED lighting reflects a larger trend in outdoor lighting, as evidenced by this month's National Geographic cover article (November issue, 2008). The softer, whiter directional LED lamps provide exceptional clarity and visibility on areas that require light, without sending stray light into areas that are best left dark. The result is an enhanced night time setting, with marked reduction in light pollution and energy usage.

The Benefits

There has been an increased amount of positive activity in the area as a result of the lights, but beyond the practical use, Hansen said the project helps students think about how they use energy. "When you walk down that area at night time, it really gives you a feeling of comfort and safety. And, we like the LED lighting" said Hansen. The long-lasting LED lights significantly reduce maintenance, and perform well in cold temperatures. The light's solar panels are positioned to shed snow, and SolarOne's proprietary SOBright™ Technology, which manages brightness and adapts to low power conditions, ensures that facilities are never left in the dark, even in the darkest days of winter and during extended cloudy periods. "The system is designed to ride through eight really cloudy days," Azzam said. Ideal for pathways, sidewalks, parking lots, and bus shelters, SolarOne® overhead lights are currently in use or being installed in locations as diverse as college campuses, corporate centers and city streets. "The SolarOne lighting really has met all of our requirements", said Hansen "They're attractive, they provide a good light for our students in the areas we wanted, and they haven't added to the expense of operations on the campus."

"It's an exciting time for lighting. The industry is undergoing rapid change with the advent of white LED lighting, dark sky mandates and soaring energy costs. The fixtures are dark sky compliant, allowing night time star gazing. Each lamp will offset an estimated 4,000 pounds of green house gases annually, while providing the peace of mind that it will be operational, even during emergencies when the grid may be down.

Solar Renaissance Lamp Post Project Manager, Colleen Emery

Sullivan County, New York

Client
Sullivan County, New York

Project
Going Green in Sullivan County

Location
Woodridge, Swan Lake and Bethel New York

Luminaires and Controls
Philips Hadco's Solar/LED Fixtures & Technology

Light Source
Solar/LED

Lighting Effect
Solar LED Decorative Lighting

Lighting Support
Philips Hadco, Solar One

Background

The Liberty community wanted fixtures that would enhance the beauty of the park and provide safety. But also, they wanted lights that were "Dark Sky" compliant. The town's leadership was delighted to usher in Liberty's first eco-friendly lights. "In this rapidly changing world, it is important for municipal government to try out new forms of energy", said Frank DeMayo, Town Supervisor. Liberty is proud to be included in a solar lighting project, which we are confident will work to the benefit of our taxpayers, our public and the environment.

The Challenges (the opportunity)

How do you sell an expensive lighting system to cost-conscious property owners? Consider this: We've arrived at the perfect storm of economics for solar-powered LED lights. Energy prices are up and eco-friendly thinking is growing in popularity. But also, the price of LEDs may begin to drop. Small parks and campuses may be just the right market for energy-free lighting, even in tough economic times. According to DeMayo, the new lights showcase how Liberty is not only friendly to the environment but friendly to companies that are green themselves. "We're looking to set a tone as an environmentally conscious place – to make Liberty a green community. We're going to do the responsible thing."

The Solution

Three locations in Sullivan County are brightening the outdoor lighting environment of the future, in terms of solar energy solutions aimed at improving sustainability. The Woodridge site features 12 stand-alone solar lights installed as Main Street lighting in a two-year study conducted by Sullivan Renaissance, a community beautification and development program funded by the Gerry Foundation and the New York State Energy Research and Development Authority (NYSERDA), which provides energy-related technical and financial assistance to residents, businesses and institutions to promote energy efficiency and economic development in New York State. The light's design resulted from a collaboration between Sandy Gerry's vision to make clean technology look more beautiful and familiar, combined with Philips Hadco's lighting period design and craftmenship.

The Benefits

It's an exciting time for lighting", said Colleen Emery, project manager of the solar renaissance lamp post demonstration project. "The industry is undergoing rapid change with the advent of white LED lighting, dark sky mandates and soaring energy costs. The fixtures are dark sky compliant, allowing night time star gazing. Each lamp will offset an estimated 4,000 pounds of green house gases annually, while providing the peace of mind that iy will be operational, even during emergencies when the grid may be down.

Custom and Modification

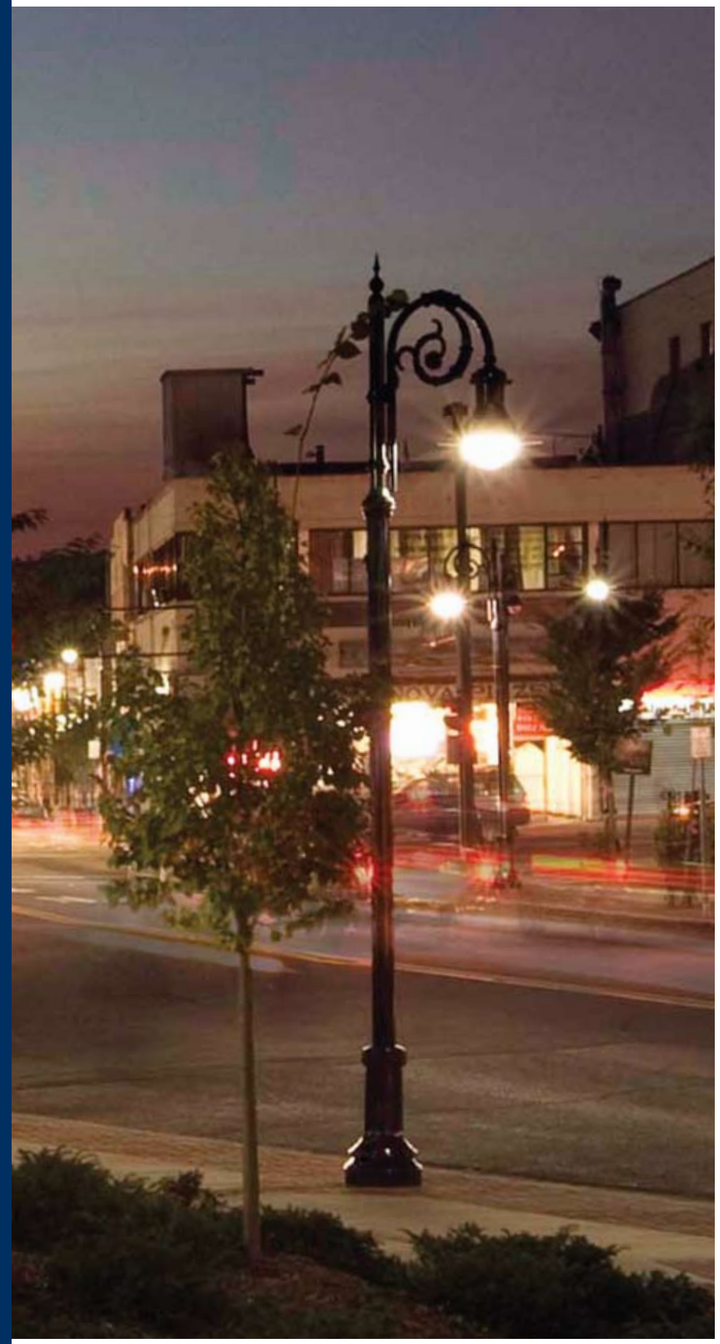
We help you build your vision

Every Philips Hadco creation – and, really, our company itself – has grown out of our close interaction with lighting design professionals. Along the way, we've learned a lot . . . in particular, we've learned that no two projects are exactly alike. So for us, new ideas and special projects are standard procedure.

In fact, custom and modified products make up a significant portion of our sales. We welcome questions and can offer advice about application, lamp placement and lighting objectives. And our team of custom engineers and technical specialists responds quickly and expertly to new ideas. Using powerful engineering and drafting software, they can create custom cutsheets to help you envision your ideas.

Once your design is perfected, we'll use the latest manufacturing techniques to build it: to your specifications, and on time.

So if you're thinking about modifying an existing design or building something new, we'd love to hear about it. Don't hesitate to contact us.

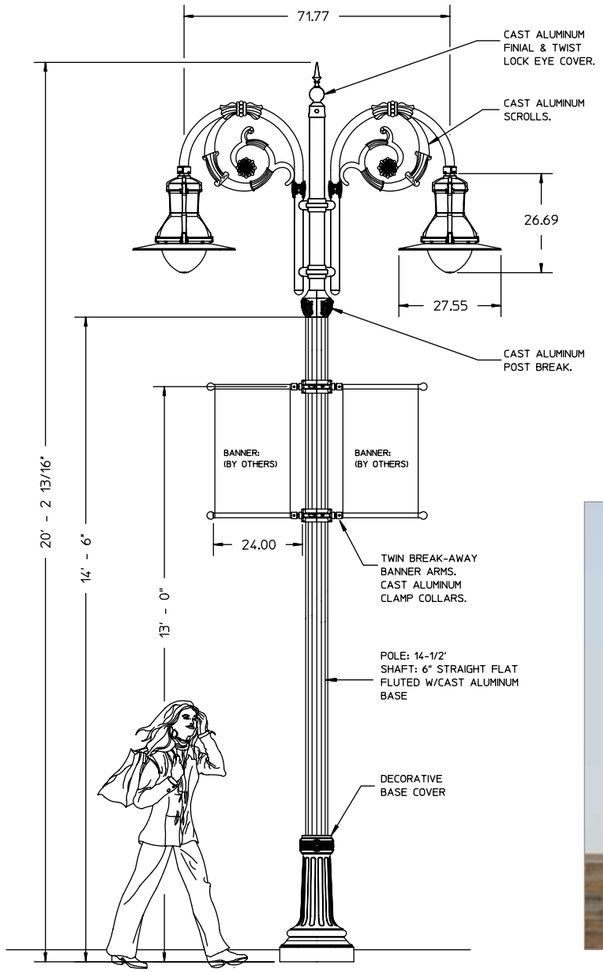


The Plainfield

Since 1685, when the first seven families settled there, the city of Plainfield, New Jersey, has had a strong sense of identity. So when it came time to update the city's outdoor lighting, we knew the project deserved a signature style... and we built them a custom streetlight they could call their own.

As illustrated, we used a 6″ flat flute pole with an additional steel insert for structural integrity. We then created straight and shepherd's crook arms with custom-cast aluminum scrolls and filigrees. Because of the fixture's large size, we welded together two separate halves to construct the straight-arm scroll. And, as a finishing touch, we created a 20″ diameter two-piece, heavy-duty cast aluminum Madison-style base.

As a result, the Plainfield design does more than illuminate the city's streets; it reflects the city's heritage.



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R52GANA
(with modified logo cage)

Shown: **R34BNNN**, with custom Philips Hadco logo cage.

Custom Street Graphics

Introduction Overview

Decorative lighting alone can make an immediate and significant change in your environment. Philips Hadco's decorative cage can be customized to fit your communities' needs.

Philips Hadco's customized logos are designed to meet your customer's specifications. The logos are computer generated and transferred to durable Commercial Quality Contact Vinyl for adhesion to a white opal acrylic mounting insert.

The logos above are just a few examples of designs that could personalize a fixture in your community.

Below are a few color selections for the cage band.

White	Green	Blue	Red

Logo and Band Color

AO	Black Opaque	VO	Verde Opaque
WO	White Opaque	WT	White Translucent
HO	Bronze Opaque	HT	Bronze Translucent
JO	Green Opaque	JT	Green Translucent
RO	Red Opaque	RT	Red Translucent
BO	Blue Opaque	BT	Blue Translucent
GO	Gold Opaque	YT	Yellow Translucent
YO	Yellow Opaque		

1. Letter/Shape – specify color, opaque, or translucent.

2. Background – specify color, opaque, or translucent.

3. Base Material – translucent white opal.

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Solar LED

Efficiency, ease of installation and reduced impact on the surrounding envrionment are all reasons to consider an integrated Solar/LED solution from Philips Hadco.

On the following page, we've included some examples of the LED and solar-capable fixtures currently available. As you can see from these few selections, we are dedicated to offering devices that blend seamlessly into any project you may be planning.

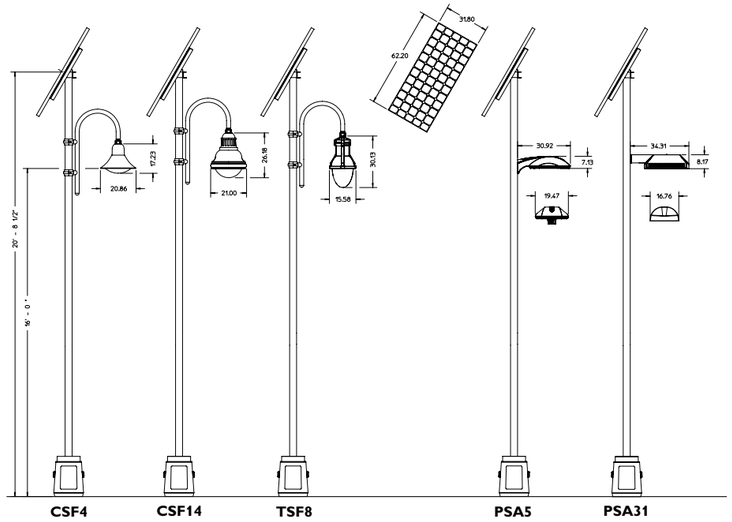
Our traditional shapes of the Pendant and Post-Top series provide "off grid" lighting, so there is no need to trench for electrical lines. This offers flexibility to provide lighting without the extra cost of materials and labor to build or increase wired infrastructure, much less the recurring cost of utility power.

The Benefits of Solar LED

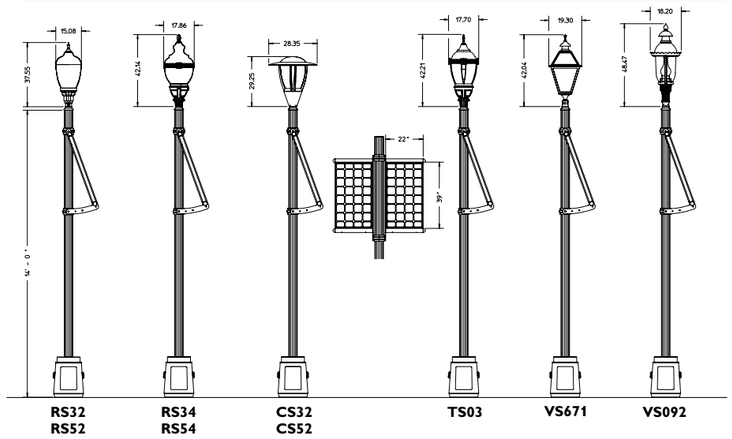
LEDs are fundamentally compatible with solar energy. On a very conceptual basis an LED is the inverse of a solar cell. A solar cell is a semi-conductor device that converts light to electricity, while an LED is a semi-conductor device that converts light to electricity to light. LED's "control-ability" enables them, through intelligent controls, to adapt to the ebb and flow of the solar energy through changing weather patterns and seasons. Like solar cells, LEDs offer "solid state" reliability - lasting at least a decade, if not longer. LEDs efficiency and lifetime improves under colder conditions - when the system needs it the most. And then of course, well designed LED lighting systems can reduce the number of lighting systems on a project by 20% or more and still achieve exceptional lighting results.

Pendant Series

Street and Area Series



Post Top Series



Consult factory for the latest Solar LED product specifications.

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At times when an H.I.D. Lighting System becomes inoperative, a complex, thorough, trouble-shooting procedure may prove overly time consuming. In these instances, a simple check of the power switches, when a bank of fixtures becomes inoperative, or a visual check of the lamp, when a singular fixture becomes inoperative, may provide the quickest response to the problem. At other times, when individual isolated fixtures are involved, it may be necessary to systematically isolate the problem and perform complete electrical tests in order to properly restore the lighting.

The four basic trouble-shooting methods outlined in this booklet offer procedures which can be applied to cover virtually all situations:

1. **VISUAL INSPECTION CHECK LIST** – Quick visual checks for normal end-of-lamp life and application irregularities not requiring electrical testing.
2. **QUICK FIX FOR RESTORING LIGHTING** – Where lighting must be immediately restored.
3. **TROUBLESHOOTING FLOW CHARTS** – Simplified diagrams to quickly locate the problem in any given lighting fixture based on the lamp characteristics.
   A. Lamp will not start
   B. Lamp cycles
   C. Lamp too bright or dim
4. **ELECTRICAL TESTS** – In-depth check of system by performing electrical tests.

1. VISUAL INSPECTION CHECK LIST – NORMAL END OF LAMP LIFE

Mercury and Metal Halide Lamps

These lamps at end-of-life are characterized by low light output and/or intermittent starting. Visual signs include blackening at the ends of the arc tube and electrode tip deterioration.

High Pressure Sodium Lamps

Aged HPS lamps will tend to cycle at end-of-life. After start-up, they will cycle off and on as the aged lamp requires more voltage to stabilize and operate the arc than the ballast is capable of providing.

Visual signs include a general blackening at the ends of the arc tube. The lamp may also exhibit a brownish tinge (sodium deposit) on the outer glass envelope.

Low Pressure Sodium Lamps

At end-of-life, these lamps retain their light output but starting first becomes intermittent and then impossible. Visual signs include some blackening of the ends of the arc tube.

ADDITIONAL CHECKS

Lamps

- Broken arc tube or outer lamp jacket.
- Lamp broken where glass meets the base.
- Broken or loose components in lamp envelope.
- Arc tube end blackening.
- Deposits inside outer glass envelope.
- Lamp type (H, M, S, or L number) and wattage must correspond to the required ballast label.
- Lamp orientation designation (BU or BD) incorrect for application (base up, base down, etc.).

Lighting System Components

- Charred ballast coils.
- Damaged insulation or coils on ballast.
- Evidence of moisture or excessive heat.
- Loose, disconnected, pinched or frayed leads.
- Incorrect wiring.
- Swollen or ruptured capacitor.
- Damaged ignitor.

2. QUICK FIX FOR RESTORING LIGHTING

Visual Inspection

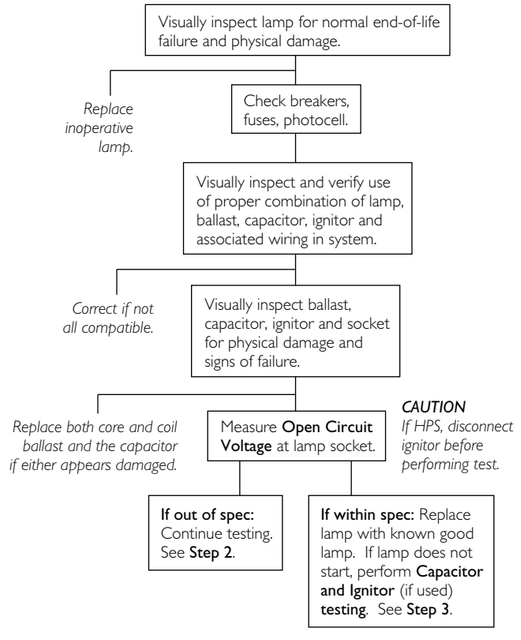
- Visually inspect lamp, ballast, capacitor, and ignitor (where used) for physical signs of failure, replacing any apparently defective components.
- If either core and coil ballast or the capacitor appear abnormal, replace both.

Component Replacement Where No Visual Defects Appear

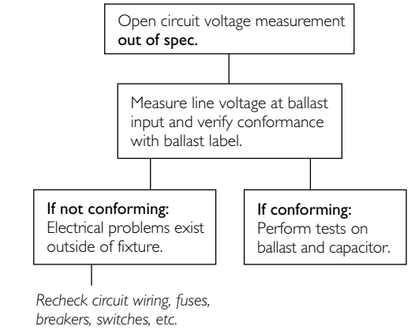
- Verify that the correct line voltage is being supplied to the fixture.
- Check power switches, circuit breakers, fuses, photo control, etc.
- Replace lamp.
- Replace ignitor (where used).
- Replace both ballast and capacitor.

3. FLOW CHARTS (see below)

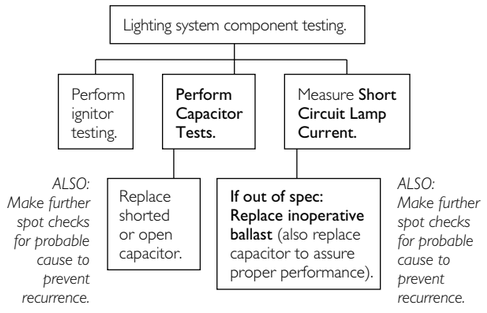
A. Lamp will not start (Step 1)



A. Lamp will not start (Step 2)



A. Lamp will not start (Step 3)



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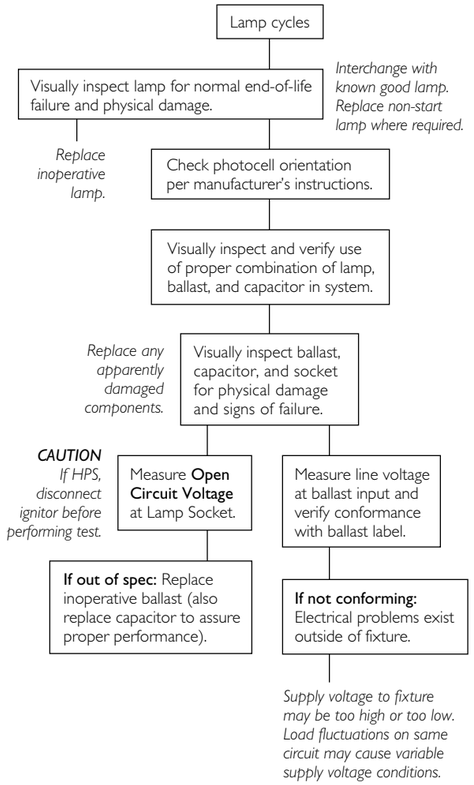
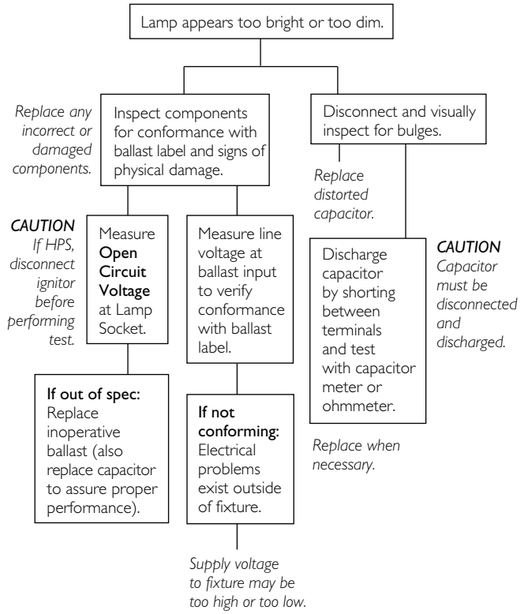
B. Lamp cycles



C. Lamp too bright or dim



4. ELECTRICAL TESTS

NOTE: Voltage and current measurements present the possibilityof exposure to hazardous voltages and should be performed only by qualified personnel.

The following equipment is recommended for Testing H.I.D. fixtures:

- RMS Voltmeter
- Ranges: 0-150-300-750 Volts AC
- Ammeter (Clamp-on type acceptable)
- Ranges: 0-1-5-10 Amperes AC
- Multi-meter (with voltage and current ratings shown above)
- Ohmmeter

Line Voltage

Measure the line voltage at input to fixture to determine if the power supply conforms to the requirements of the lighting system. For constant wattage ballasts, the measured line voltage should be within 10% of the nameplate rating. For high reactance or reactor ballasts, the line voltage should be within 5% of the nameplate rating.

If the measured line voltage does not conform to the requirements of the lighting system as specified on the ballast or fixture nameplate, electrical problems exist outside of the fixture which can result in non-starting or improper lamp operation.

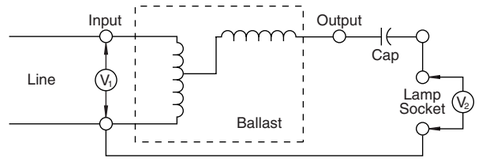
Check fuses, breakers, and switches when line voltage readings cannot be obtained. High, low or variable voltage readings may be due to load fluctuations on the same circuit.

Open Circuit Voltage

To determine if the ballast is supplying proper starting voltage to the lamp, an open circuit voltage test is required. The proper test procedure is:

1. Measure input voltage (V1) to verify rated input voltage is being applied.
2. With the lamp out of the socket and the proper voltage applied to the ballast, read the voltage (V2) between the socket pin and shell. Reading must be within test limits shown.

OPEN-CIRCUIT VOLTAGE TEST



As an alternative, this test may also be performed simply by screwing an adapter into the lamp socket for easy access. Then hook up the voltmeter to this adapter. Reading must be within test limits shown.

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Wind Loads

Decorative Pole Windloading

The Effective Projected Area or EPA is a wind resistance rating given for fixtures, brackets, and accessories. The total of all accessory EPA ratings must not exceed the pole capacity EPA for the wind zone where it is installed.

There may be more than one wind velocity in any geographical area, such as the greater Tampa, Florida, area which has three different wind zones. Lighting poles must also be selected that can withstand the additional stresses caused by weight. Please check local ordinances/building codes for up-to-date requirements.

Pole Banner Loading

The largest EPA addition to any pole will be from single or double rectangular shaped decorative banners and street signs. The surface area exposed to the wind creates a high EPA value when compared to fixtures and arm brackets and a larger pole diameter or thicker wall may be required. Always contact the factory whenever banners are used.

Philips Hadco poles are designed to meet industry accepted wind-loading practices for decorative street lighting standards. State or federal lighting projects may require decorative poles to meet specifications established by the American Association of Street and Highway Traffic Officials (AASHTO). Consult the factory for separate EPA capacities according to AASHTO recommendations.

Shown: **Refractive Globe LED**, Pompton Lakes, New Jersey.

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Introduction Overview

Like any other industry, lighting has a language of its own.

Listed below are some of the most common words and terms used within the lighting industry.

0-10V Dimming – A dimming method that regulates the amount of power to LEDs. A 0-10VDC signal is sent to the LED driver which reduces LED drive current to achieve a desired dimming level.

Absolute Photometry – The method for determining light output and light distribution of luminaires where the performance of the entire luminaire – including lamp(s) – is measured. Absolute photometry is the standard method prescribed in IES LM-79 for testing LED luminaires.

Acrylic – The generic term for a family of quality light-stabilized plastics used in making luminaire diffusers and lenses.

AlInGaP – The aluminum indium gallium phosphide material system for manufacturing red and amber high-brightness LEDs.

Amalgam – An alloy of mercury and other metals. Can be used in fluorescent lamps to control the mercury vapor pressure in the discharge. The alloy absorbs or releases mercury in relation to the amalgam temperature.

American National Standards Institute (ANSI) – An organization that develops voluntary consensus standards and conformity assessment systems for products, services, processes, systems, and personnel in the United States.

ANSI – See American National Standards Institute.

Ballast – A device used with an electric discharge lamp (H.I.D. or fluorescent) to obtain the necessary circuit conditions (voltage, current, and wave form) for starting and operating. Common types are magnetic (core and coil) and electronic.

Beam Angle – The angle between the two directions (horizontal and vertical) for which the intensity is 50% of the maximum intensity as measured in a plane through the nominal beam centerline. Note that in certain fields of application, beam angle was formerly measured to 10% of maximum intensity.

Beam Lumens – The total flux in the beam where the intensity exceeds 50% of the maximum intensity.

Beam Spread – The angle between the two directions in the plane (horizontal and vertical) in which the intensity is equal to a stated percentage of the maximum beam intensity.

Binning – General term for the production and sorting methodologies used by LED makers to ensure that the LEDs they manufacture conform to stated specifications for forward voltage, color, and luminous flux.

Blackbody Curve – A curve within a color space describing the sequence of colors emitted by a blackbody radiator at different temperatures.

Blackbody / Blackbody Radiator – An object that absorbs all electromagnetic radiation falling on it. Because it reflects no light, a blackbody appears black. As a blackbody is heated to incandescence, it radiates light in a sequence of colors, from red to orange to yellow to white to blue, depending on its temperature. This color sequence describes a curve within a color space, known as the blackbody curve.

Brightness – The subjective impression of the intensity of a light source. Often used incorrectly as a synonym for luminous flux, an objective measurement of the visible power of a light source.

BUG Rating – A rating for outdoor luminaires that defines the amount of maximum zonal lumens in the Backlight (B), Uplight (U) and Glare (G) zones as designated per the Luminaire Classification System (LCS) in IES TM-15

Candela (cd) – The fundamental unit of luminous intensity (in a particular direction). One candela is one lumen per steradian (lm/sr).

Candlepower (cp) – Luminous intensity (in a particular direction) expressed in candelas.

Candlepower Distribution Curve – A curve showing the variation of luminous intensity (in cp) of a lamp or luminaire at various angles.

CCT – See Correlated Color Temperature.

CFL – See Compact Fluorescent Lamp.

Chromaticity – The dominant or complementary wavelength and purity aspects of the color taken together. An objective specification of the quality of a color, independent of its luminance, as determined by its saturation and hue.

CIE – See International Commission on Illumination (CIE = Commission Internationale de l'Éclairage).

CIE 1931 color space – A color space created by the International Commission on Illumination (CIE) in 1931 to define the entire gamut of colors visible to the average viewer.

CIE Standard Chromaticity Diagram – One in which the x and y chromaticity (color) coordinates are plotted in rectangular coordinates.

Coefficient of Utilization (CU) – The percentage of light from a luminaire which reaches the target task. It is a function of the luminaire, each having its own set of CU's for a wide range of factors.

Collimator – Term used to describe the secondary lens that aligns and shapes an LED's beam of light. See Lens.

Color Rendering – General expression for the effect of a light source on the color appearance of objects when compared with their color appearance under a reference light source.

Color Rendering Index (CRI) – Measures the ability of a light source to reproduce the colors of various objects faithfully in reference to an ideal light source. The best possible faithfulness to the reference source has a CRI of 100.

Color Temperature – See Correlated Color Temperature.

Compact Fluorescent Lamp (CFL) – A type of fluorescent lamp with relatively low power draw, often designed to replace an incandescent lamp. Generally includes an amalgam to stabilize light output over a broad range of ambient temperatures.

Lighting Terminology

Introduction Overview

Correlated Color Temperature (CCT) – Describes whether white light appears warm (reddish), neutral, or cool (bluish), based on the appearance of light emitted by a black body heated to various temperatures. CCT is expressed in Kelvin (K).

Cosine Law – A law stating that the illuminance "E" on any surface varies as the cosine of the angle of incidence "θ". The angle of incidence is the angle between the normal to the surface and the direction of the incident light. The inverse-square law and the cosine law can be combined as $E = (I * \cos \theta)/d2$.

CRI – See Color Rendering Index.

Cut-off Angle (of luminaire) – The angle, measured up from nadir, between the vertical axis and the first line of sight at which the bare source is not visible.

Delivered Light – The amount of light a luminaire or lighting installation delivers to a target area or task surface, expressed in footcandles (fc) or lux (lx).

Diffuser – A device to redirect or scatter light from a source, primarily by the process of diffuse transmission. See Lens.

Efficacy – The amount of light produced (in lumens) per unit of energy consumed (in watts), expressed in lm / W. Not to be confused with luminous efficiency.

Efficiency – See Luminaire Efficiency.

Eye-sensitivity Curve – See Spectral Luminous Efficiency V(λ) Function for Photopic Vision.

Field Angle – The angle between the two directions (horizontal and vertical) for which the intensity is 10% of the maximum intensity as measured in a plane through the nominal beam centerline. Note that in certain fields of application, the angle of the 10% of maximum directions was formerly called beam angle.

Field Lumens – The total flux in the beam where the intensity exceeds 10% of the maximum intensity.

Fixture – See Luminaire.

Flush Mounted or Recessed – A luminaire that is mounted with the opening of the luminaire level with the surface.

Flux – See Luminous Flux.

Footcandle (fc) – A unit of illuminance that measures the intensity of light falling on a surface area measured in square feet. One footcandle is one lumen per square foot (lm/ft2). 1 footcandle = 10.76 lux.

Forward Voltage (Vf) – Occurs when a negative charge is applied to the n-type side of an LED, allowing current to flow from the negatively-charged area to the positively-charged area. Applying rated forward voltage causes LEDs to emit light.

Glare – The sensation produced by luminances within the visual field that are sufficiently greater than the luminance to which the eyes are adapted to cause annoyance, discomfort, or loss in visual performance or visibility. Note: The magnitude of the sensation of glare depends upon such factors as the size, position and luminance of a source, the number of sources and the luminance to which the eyes are adapted.

Glare, Direct – Glare resulting from high luminances or insufficiently shielded light sources in the field of view. A direct glare source may also affect performance by distracting attention.

Glare, Disability – Glare resulting in reduced visual performance and visibility and often accompanied by discomfort.

Glare, Discomfort – Glare producing discomfort. It does not necessarily interfere with visual performance or visibility.

Goniophotometer – A photometric device for testing the luminous intensity distribution and luminous flux of luminaires.

HB-LEDs – High-brightness LEDs. A synonym for illuminator-type LEDs such as those used in outdoor lighting.

Heat Sink – A feature or device that conducts and radiates heat away from sensitive components, such as LEDs and electronics.

H.I.D. – See High Intensity Discharge.

High Intensity Discharge (H.I.D.) – High intensity discharge lighting, including mercury vapor, metal halide and high pressure sodium light sources. Although low pressure sodium lamps are not H.I.D. sources, they often are included in the H.I.D. category.

HP-LEDs – High-power LEDs. A synonym for illuminator-type LEDs such as those used in outdoor lighting.

IEC – See International Electrotechnical Commission.

IES – See Illuminating Engineering Society of North America.

IESNA – See Illuminating Engineering Society of North America.

Illuminance (E) – The areal density of luminous flux falling on a surface. Measured in footcandles (fc) or lux (lx). An alternative term is illumination.

Illuminating Engineering Society of North America (IES) – The recognized technical authority on illumination, communicating information on all aspects of good lighting practice to its members, to the lighting community, and to consumers through a variety of programs, publications, and services.

Illuminator-type LEDs – High-performance, high-power LEDs capable of providing functional illumination.

Induction – Lighting system consisting of a lamp vessel, power coupler and HF generator (the electronics that regulate and convert incoming power for system starting and operation). Another type of "light source" used in outdoor luminaires.

Infrared (IR) – Electromagnetic radiation with wavelength longer than that of visible light.

Lamp – A light source. Lamps are used for outdoor lighting include H.I.D., incandescent (including tungsten halogen), and fluorescent.

Lamp Lumen Depreciation (LLD) – A factor used in lighting calculations to account for the light loss that takes place in a lamp due to the gradual decay in lumen output over a designated period of burning time. The LLD is contingent upon relamping schedules and the specific lamp involved.

LED – See Light Emitting Diode.

LED Driver – An electronic circuit that converts input power into a current source — a source in which current remains constant despite fluctuations in voltage. An LED driver protects LEDs from normal voltage fluctuations, overvoltages, and voltage spikes.

Lens – A transmitting element used to change the direction and control the distribution of light rays. The shielding or diffuser portion of a luminaire made of plastic or glass through which the light passes on its way to the light task.

Light Emitting Diode (LED) – A semiconductor device that emits visible light of a certain color or, for white LEDs, light of a certain CCT.

Lighting Distribution – Luminaires are classified according to the manner in which they control or distribute the luminous flux.

Light Loss Factor (LLF) – A factor used in calculating the level of illumination after a given period of time and under given conditions. It takes into account temperature, dirt accumulations on the luminaire and room surfaces, lamp depreciation due to aging, and atmosphere conditions.

Light Trespass – A situation which occurs when, due to lack of adequate beam control, light from a source is distributed onto areas where the illumination is not wanted.

Louver – A series of baffles used to shield a source from view at certain angles or to absorb unwanted light.

Lumen (lm) – The unit of luminous flux. Photometrically, it is the luminous flux emitted within a unit solid angle (one steradian) by a point source having a uniform luminous intensity of one candela.

Lumen Maintenance – Describes how long a light source or luminaire will retain a certain percentage of its initial lumen output. For instance, L70 is the length of time a light source or luminaire retains 70% or more of its initial lumen output. The standard method for measuring lumen maintenance of LEDs is prescribed in IES LM-80.

Luminaire (light fixture) – A complete lighting unit consisting of a lamp(s) and ballast(s), induction system, or LEDs and LED driver(s) together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply.

Luminaire Dirt Depreciation (LDD) – A factor used in lighting calculations to account for the light loss due to the accumulation of dirt on the luminaire. The LDD is contingent upon environment, cleaning schedules, and the type of luminaire involved.

Luminaire Efficiency – The ratio of luminous flux (lumens) emitted by a luminaire to that emitted by the lamp or lamps used therein.

Luminance – The amount of light emitted or reflected from a particular area, measured in candelas per square foot (cd/ft2) or candelas per square meter (cd/m2). The term brightness should not be used to denote the concept of luminance.

Luminous Flux – Radiant flux (radiant power). The time rate of flow of radiant energy, evaluated in terms of a standardized visual response. Unless otherwise indicated, the luminous flux is defined for photopic vision. The total energy emitted by a light source across the visible wavelengths of light, measured in lumens (lm).

Luminous Intensity – The luminous flux per unit solid angle in a particular direction, measured in candela.

Lux (lx) – The metric unit of illuminance that measures the intensity of light falling on a surface area measured in square meters. One lux is one lumen per square meter (lm/m2). 10.76 lux = 1 footcandle. Decalux = 10 lux.

MacAdam Ellipse – An ellipse, drawn over a color space, that defines the threshold at which a color difference becomes perceptible. See Standard Deviation of Color Matching (SDCM).

Matte Surface – A surface from which the reflection is predominantly diffuse, with or without a negligible specular component.

Mounting Height, MH (roadway) – The vertical distance between the light source of the luminaire and the surface to be lit. It includes both the pole height and the base height (above grade) to which the pole is affixed.

Nanometer (nm) – The most common unit to describe the wavelength ("color") of light, equal to one billionth of a meter.

N-type Material – In an LED's p-n semiconductor junction, n-type material is negatively charged. Atoms in the n-type material have extra electrons.

Optical System – The lamp cavity or environment (including diffusing media, lenses, collimators) designed as part of the luminaire for the purpose of controlling the light output.

Overhang – In roadway lighting, the distance between a vertical line passing through the luminaire and the curb or edge of the roadway.

Parabolic – The term applied to certain low brightness louver and reflector shapes as derived from the geometric shape (curve) called a parabola where, if a light source is placed at the focal point of the parabola, the resultant emitted light will be redirected parallel to the parabola's geometric axis.

Phosphor – A coating of phosphorescent material that absorbs light from a blue or UV LED chip and emits most of its output in the yellow range. The proper combination of a blue or UV LED chip and a phosphor coating generates white light.

Lighting Terminology

Introduction Overview

Phosphor White – A method of producing white light in a single LED by combining a short-wavelength LED chip, such as blue or UV, and a yellow phosphor coating.

Photometry – The measurement of quantities associated with light.

Photon – A quantum of radiant energy (including visible light).

Power Factor (PF) – A measure of how effectively a luminaire's power source converts electric power input to useful power output. The further the power factor is from the ideal PF (1.0), the less effective the power conversion resulting in more wasted power.

Power Factor Correction (PFC) – The use of components to adjust the power factor back toward the ideal (1.0). In magnetic (core and coil) ballasts capacitors are used. In electronic ballasts, induction HF generators and LED drivers integral electronic components are used.

p-type Material – In an LED's p-n semiconductor junction, p-type material is positively charged. Atoms in the p-type material have electron holes (electrons missing from their outer rings).

Pulse Width Modulation (PWM) – A dimming method that regulates the amount of power to LEDs. PWM turns LEDs on and off at high frequency, reducing total ON time to achieve a desired dimming level.

Recessed – See Flush Mounted or Recessed.

Reflection – A general term for the process by which the incident flux (or light) leaves a (stationary) surface or medium from the incident side, without change in frequency.

Reflector – A device used to redirect the flux (or light) from a source by the process of reflection.

Refraction – The process by which the direction of a ray of light changes as it passes obliquely from one medium to another in which its speed is different.

Refractor – A device used to redirect the flux (or light) from a source, primarily by the process of refraction.

Relative Photometry – The method for determining light output and light distribution of luminaires where the performance of the luminaire is measured relative to the performance of its lamp(s). Relative photometry is the standard method used for testing conventional luminaires including H.I.D.

Remote Phosphor – A technique that separates the phosphor from the chip in a white-light LED, improving the extraction efficiency of emitted light.

SDCM – See Standard Deviation of Color Matching.

Setback – The distance that the center of the luminaire is behind the area to be lighted by that luminaire.

Shielding Angle (of a luminaire) – The angle between a horizontal line through the light center and the line of sight at which the bare source first becomes visible.

SMDs – Surface-mount LEDs. See illuminator-type LEDs.

Spacing (roadway lighting) – The distance between successive lighting units, measured along the center line of the street.

Spacing-to-Mounting-Height Ratio, S/MH – The ratio of the actual distance between luminaire centers to the mounting height.

Specular Surface – A surface from which the reflection is predominantly regular. Shiny or glossy surfaces (including mirror and polished metal) that reflect incident light.

Spectral Luminous Efficiency V(λ) Function for Photopic Vision – A bell-shaped curve describing the sensitivity of the human eye with normal vision to the spectrum of visible light. Also known as the eye-sensitivity curve.

Spill Light – Lumens distributed by the luminaire which are outside the beam spread.

Steradian – The standard unit of solid angle. Describes two-dimensional angular spans in three-dimensional space.

Standard Deviation of Color Matching (SDCM) – Describes the difference between two colors. A difference of one to three SDCM "steps" is virtually imperceptible, a difference of four SDCM steps is just noticeable, and a difference of more than four SDCM steps is readily visible. See MacAdam Ellipse.

Surface Mounted – Any luminaire mounted directly on a wall or on the ceiling

Suspended (Pendant) – A luminaire that is hung from a ceiling by supports (chains, hangers, stems, etc.).

Useful Life – The length of time it takes an LED light source to reach a certain percentage of its initial lumen output. Commonly defined as lumen maintenance thresholds L70 (70% of initial lumen output) and L50 (50% of initial lumen output).

Useful Light – The amount of light a lighting luminaire delivers in an application, minus any wasted light.

Ultraviolet (UV) – Electromagnetic radiation with wavelength shorter than that of visible light.

Wet Location Luminaire – A luminaire designed, tested and approved for installation in wet locations (such as outdoors) per UL standards. It can also be described as "enclosed and gasketed".

Warranty

Philips Hadco Commercial Warranty

A. Philips Hadco warrants that its products (other than ballasts, lamps, photoelectric controls and emergency battery packs) are free of defects in workmanship and materials for a period of three (3) years except as indicated below:

1. Ten (10) year extended warranty for all grade mounted composite, copper & transformers.
2. Lifetime warranty for cast bronze and stainless steel.
3. Five (5) year extended warranty for LED engines & drivers.

SUCH WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Philips Hadco, at its sole option, will repair or replace, F.O.B. our factory, freight prepaid, any Philips Hadco product (other than ballasts, lamps, photoelectric controls and emergency battery packs) defective in workmanship or materials. Such repair or replacement is the sole and exclusive remedy against Philips Hadco and is limited to three (3) years from date of original shipment by Philips Hadco. Philips Hadco reserves the right to determine whether to repair or replace.

No charge-back, or charge for labor or material, that does not have Philips Hadco's prior written approval from its Corporate Offices will be honored, accepted or paid by Philips Hadco. Philips Hadco will not be responsible for any consequential or incidental damages in connection with any breach of its aforementioned warranty.

B. Ballasts, lamps, photoelectric controls and emergency battery packs may be covered by separate ballast manufacturers' warranties. Philips Hadco does not make any warranties whatsoever as to these items which are sold by Philips Hadco "AS IS," and Philips Hadco will accept no responsibility or liability whatsoever therefore.

C. Philips Hadco will not be responsible for any products subjected to inappropriate application or installed or modified in any way that is not in accordance with Philips Hadco's instructions.

D. No agent, employee or representative of Philips Hadco has any authority to bind Philips Hadco to any other affirmation, representation or warranty concerning goods sold by Philips Hadco.

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