



we-ef

FOTO: SHUTTERSTOCK



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ENVIRONMENTAL CONSIDERATIONS

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WE-EF's philosophy when it comes to protecting the environment is a simple one; to create luminaires that are engineered to endure, thereby minimising the need to replace or recycle them for a long time to come.

WE-EF's entire operation from luminaire design through to the production process and subsequent application is based on this principle of longevity. Each step along the process carries with it the responsibility of environmental protection and the most effective use of resources.





REDUCE

MATERIAL INPUTS

MAINTENANCE COSTS

ENERGY CONSUMPTION

LIGHT POLLUTION

INCREASE

LIGHT EFFICIENCY

DESIGN LIFE

RECYCLABILITY

ENVIRONMENT

Design & Engineering

The most important element in the design process is the development of luminaires which encompass timeless design; design that best reflects their enduring qualities. WE-EF design carry with it all the traditions of the Bauhaus design movement and the ideals that it embraces. Objects designed to have simplicity, multiplicity and economical use of space, material, time and money. It implicitly carries with it the environmental message. The introduction of the Modern Classic range of product in 2004 takes the WE-EF design tradition further and marries the streamlining principles of the early 20th century, with the latest state of the art engineering.

This state of the art engineering brings with it the highest demands. For example, Innovative Optical Systems **IOS**® and maintenance friendly design where applicable, through to the adoption of the latest lamp technology and energy saving control gear; engineering designed for life.

Production

Translating timeless design into products that exhibit outstanding and long-lasting anti-corrosion properties, can only be achieved by a comprehensive and integrated production process. The result of many years of research, development, hands on testing and experience, WE-EF's unique **5CE** system encompasses 5 critical elements: Substrate, Conversion Coating, Powder, **PCS**® Hardware and Process Control.

Each element embraces the first WE-EF principle of longevity, whilst ensuring compliance with all international safety and quality standards including ISO 9001 certification.

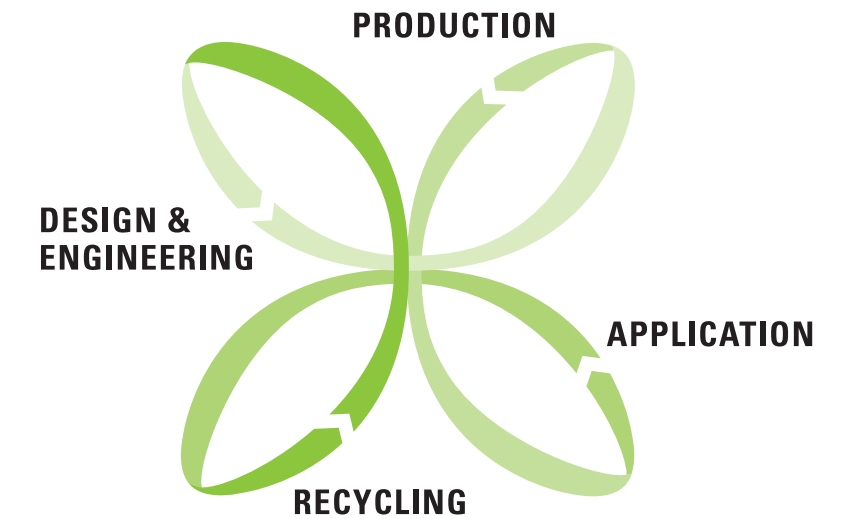
Application

Protecting the environment can mean many things; a solution to lighting an historical facade whilst protecting its unique features, providing the best lighting solution for a streetscape in terms of cost and energy savings, or simply ensuring that the lighting installation impacts minimally on an eco sensitive area.

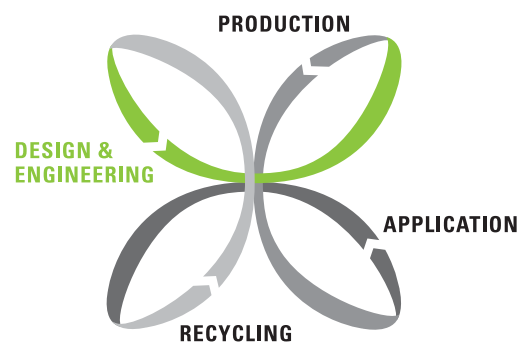
Around the world, architects, lighting consultants, designers and project engineers are faced with these new and often daunting creative and technical challenges. WE-EF actively encourages a participative exchange of ideas and perspectives among this group of professionals to help seek the appropriate solutions. This collaborative process ensures that WE-EF innovation, when it comes to particular applications, is brought to the forefront and that it parallels the demands of the global marketplace; solutions that work.

Recycling

The process begins again. It originated with an aluminium substrate that was sourced from 90% authentic refined recycled aluminium and ends with a product that is at least 90% recyclable, based on weight.



WE-EF consider the entire process of a luminaires design life as a continuous cycle. Each of the four major processes (Design & Engineering, Production, Application and Recycling) has a role in responsible environmental management, from reducing energy consumption and material inputs to controlling unnecessary light pollution. It is the Total Cost of Ownership.



WE-EF combine the latest advances in lamp technology, with specifically designed reflectors or lenses to ensure optimal output.

DESIGN & ENGINEERING

Material Considerations - Why do we use Aluminium? Aluminium is a remarkable material and is the third most common element on earth. Its benefits as a source of production are well known; plentiful, lightweight, excellent heat dissipation, easy to form and most importantly affordable. Its environmental credentials are perhaps less well understood. Although energy intensive in its conversion from Aluminium Oxide, the energy inputs required have dropped considerably from the 1950's from about 22 kWh to 13 kWh to produce 1kg of virgin aluminium. Worldwide approximately 50% of the energy required for this process is sourced from hydropower.

However, the most important point is that Aluminium is considered an 'energy storer'. The initial energy required to convert the Aluminium Oxide does not get lost. In the recycling process and the subsequent revaluing of the old aluminium, the original stored energy is reused; only 5% of the original energy input is required to recycle aluminium, in other words 95% of the original energy is also recycled. All this without any loss in quality. This is why WE-EF use over 90% authentic, refined, recycled aluminium.

Construction Considerations – Critical considerations in both the design and engineering process are a luminaire's thermal and sealing characteristics. They can impact on the environment simply in terms of the

amount of material required for production and the energy consumption.

Trend: Smaller light sources, lower wattages and compact electronic control gear. The benefits are obvious; not only the consumption of less energy during a luminaire's operation, but also the design of more compact luminaires that require less material. However, it is a balancing act, as a luminaire's size is not only dictated by the size of the lamp, but also its thermal characteristics when in operation. A larger luminaire allows better heat dissipation, an important factor in ensuring long life for lamp and heat sensitive ECG. WE-EF invests a lot of time and attention to these thermal considerations balanced against the mantra 'smaller is better'. Through in-house and independent laboratory tests, WE-EF ensures that the benefits of these new technology's are translated through state of the art engineering into products that endure.

Life Cycle: The sealing characteristics of a luminaire and its ability to prevent the ingress of water, dirt and insects is important to ensure that it operates at peak efficiency for its entire life. Once again WE-EF have adopted the latest advances in gasket technology and introduced the **Controlled Compression Gasket CCG®**, designed to maintain the same Internal Protection rating over a luminaire's design life. Conventional Gaskets

have often been the weak link in a luminaire's integrity due to degradation caused by high UV, pressure and heat. The WE-EF **CCG®** is designed to ensure minimal maintenance through the cleaning cycle regime and thereby optimizing not just the amount of light on the ground after the first year of operation, but after the twentieth year and beyond.

Lighting Performance Considerations – Supported by an in-house lighting laboratory that develops high performance Innovative Optical Systems **IOS®** WE-EF combine the latest advances in lamp technology, with specifically designed reflectors or lenses to ensure optimal output, spacing and efficiency.

An investment in tooling and precision manufacturing are requisites for inclusion in the **IOS®**. It has been developed to satisfy two specific requirements; the first relating to the various international lighting standards that prescribe performance and focus on public amenity and safety issues; the second being the wide range of customized solutions that are typically the domain of the lighting design professional.

However, optimal use of resources to maximise light output must also be balanced against the issue of light pollution and the concerns of 'Dark Sky'. WE-EF invest considerable 'know how' in how best to control spill light and provide glare free enjoyment, both through improved reflector technology and specifically designed 'cut-off' shields.

Aluminium is a remarkable material and is the third most common element on earth.



IOS® has been developed to satisfy international lighting standards as well as accommodating a wide range of customized solutions.



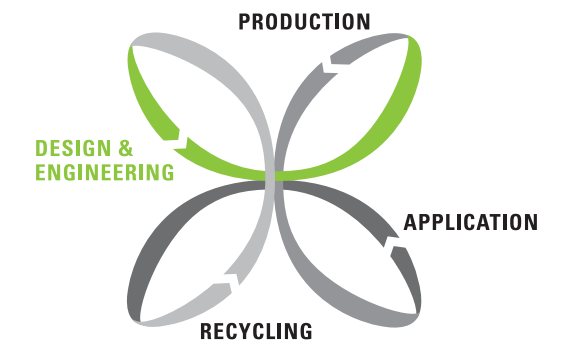
Cut Off: In street and area lighting applications **IOS®** features full cut-off light distribution in compliance with European standard EN13201:

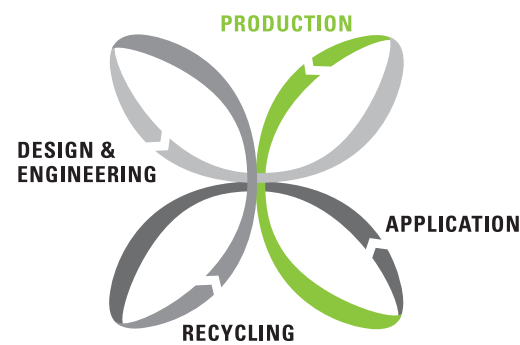
- Zero light emission above the 90° (from nadar)
- Tightly controlled candela intensities in the critical high angle glare zone at 80-90° (from nadar)
- Solutions to light trespass and 'Dark Sky' concerns

LIGHTING PERFORMANCE CONSIDERATIONS

IOS® Innovative Optical Systems applies across the WE-EF range of luminaires and includes:

- In-house CAD designed reflectors, optimised for ceramic metal halide lamps
- High photometric performance, beam efficiency and control
- Superior glare control and visual comfort through appropriate lamp shielding angles
- Tooling exclusive to WE-EF
- Optional optical accessory toolkit





PRODUCTION

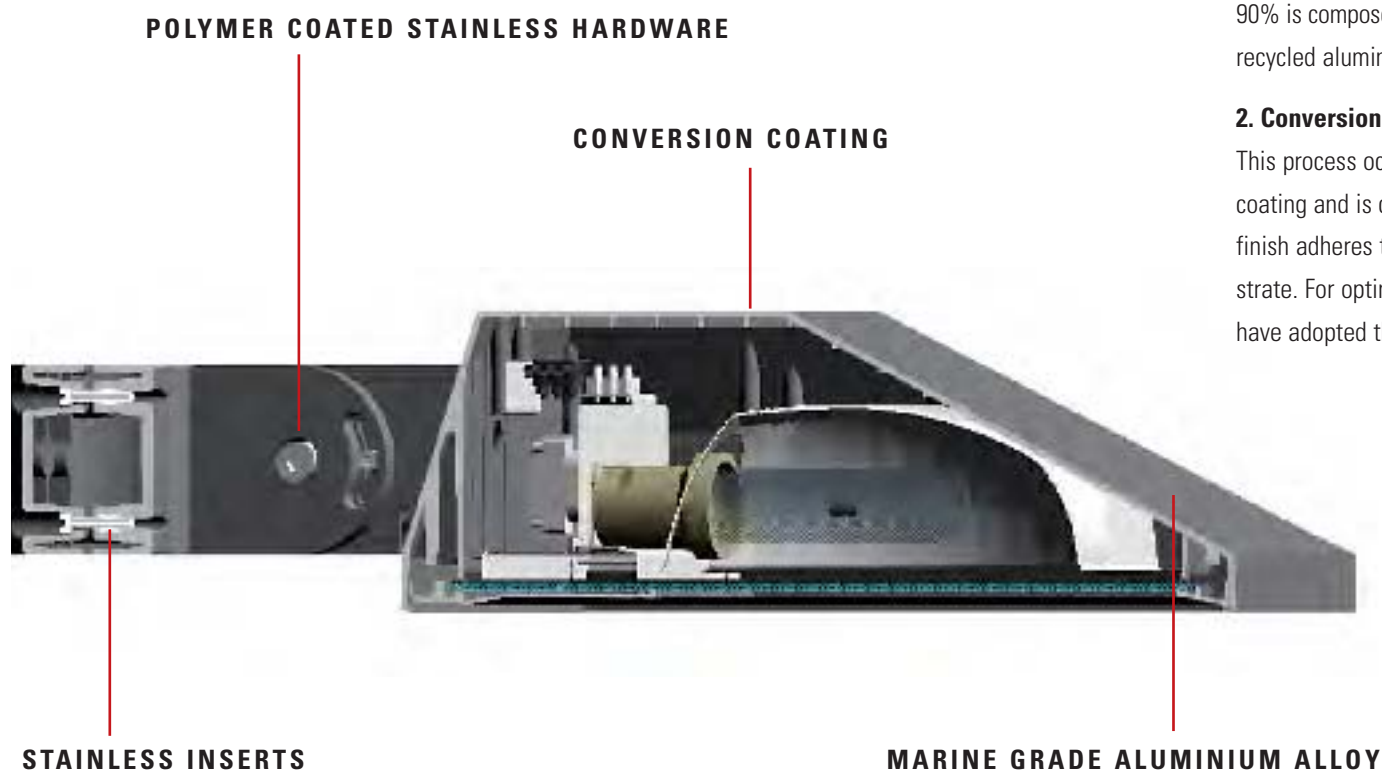
Beyond the design is engineering made to endure. WE-EF's signature 5CE system of superior corrosion protection technology ensures that the entire process of material selection, treatment and finishing is tightly controlled and environmentally compatible.

1. Substrate:

The low copper content marine grade aluminium alloy is used for all above ground luminaire bodies. These die-cast bodies provide mechanical strength and excellent heat dissipation, ideal characteristics for arduous, both low and high temperature applications worldwide. Of the material 90% is composed of authentic, refined, recycled aluminium.

2. Conversion Coating:

This process occurs prior to powder coating and is critical in ensuring the finish adheres to the aluminium substrate. For optimum bonding WE-EF have adopted the no rinse Alficoat



Brugal System (ABS) as the main conversion system. Approved in 1996 it achieves a corrosion resistance matching the quality required for exteriors. The multi-step pre-treatment and conversion coating process includes degreasing, deoxidization, etching and depending on product, chromatisation or TiZr titanium zirconium coating. Actual reaction and layer formation take place in the drying oven. Most important to the environment is that treated parts do not require rinsing, therefore there is no complex disposal of chrome containing solutions. It is considered to be the most effective conversion coat available for aluminium substrates; in compliance with all environmental standards and norms.

3. Powder:

After conversion the powder is applied to the suitable metal substrate and baked to approximately 200°C. The final finish exhibits excellent outdoor durability, and complies with German GSB and European Qualicoat standards. The grade of polyester powder used is based on saturated polyester resins. Combined with UV resistant cross-linking agents and selected pigments, it features outstanding resistance to atmospheric ageing and UV light exposure. It is free of heavy metals such as Cadmium and contains no TGIC.

4. PCS Hardware:

Unique to WE-EF, PCS® hardware is used for all critical connections to prevent harmful galvanic corrosion. All exposed hardware is made from

austenitic stainless steel, and additionally sealed with a tough impregnated polymer coat, which fulfils two functions:

- Reduced friction between male and female thread resulting in a tighter fit between connected parts.
- Providing non-metallic barrier between the two metals, aluminium and steel, preventing galvanic corrosion that otherwise occurs, when metals of dissimilar electronegativities are in contact.

Benefit: Maintenance costs are reduced due to easier access into either gear or lamp chamber, over a luminaires design life.

5. Process Control:

All materials and production steps are part of a tightly controlled process under ISO 9001 quality assurance. It includes ongoing spectrometer analysis of aluminium alloy used, daily checks of chemicals concentration in the pre-treatment phase, quality control checks on finished parts and up to 2000 hours salt spray exposure tests.

More information on the unique WE-EF 5CE System is available through our Technical Center: tc@we-ef.com.



The result is a quality product of excellent corrosion resistance, that can be serviced after years of operation, and features a powder coat finish of outstanding adhesion and colour stability.

APPLICATION

Each lighting project will have its unique characteristics and accordingly its challenges. Achieving a desired outcome balanced against the demands of environmental protection, lighting standards, public health and safety, and budgets can complicate the lighting design process. WE-EF encourages a collaborative approach on lighting projects as a way to find the solutions that work.

Streetlighting Guide

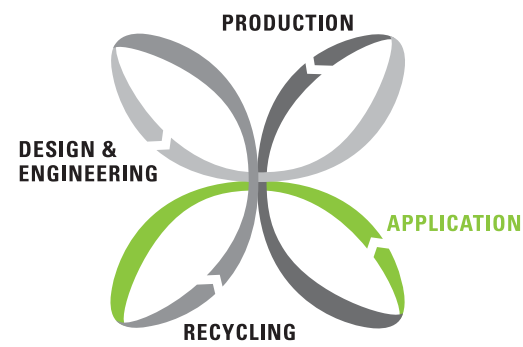
An example of this collaborative approach has seen the development by WE-EF of the Streetlighting Guide. It can help the user navigate their way through the various environmental and cost considerations, and norms related to streetlighting; a balanced solution that addresses both short and long term needs. It comes at a time when attention is focused on the potential CO₂ savings that could be achieved today by replacing older streetlighting installations.

Switching the light source from Mercury Vapour¹ to Metal Halide or Cosmopolis in combination with WE-EF IOS[®], over a 1km stretch of road for a period of 20 years, has the potential to save up to 122 Tonnes of Greenhouse Gasses². A combination of newer lamp technology and WE-EF

IOS[®] mean not only can wattage be reduced, but spacings between luminaires can be increased. Total Costs are also reduced (see tables opposite).

- 1 Mercury Vapour lamps due to be phased out under European legislation.
- 2 CO₂ saving is based only on consumption of energy due to operation. It does not take into account the potential energy savings due to less luminaires and poles being required and therefore manufactured.

More information on the Streetlighting Guide is available through our Technical Center: tc@we-ef.com.



Real and sustainable cost and energy savings, can only be achieved through optimal planning and the application of the latest luminaire and lamp technology.

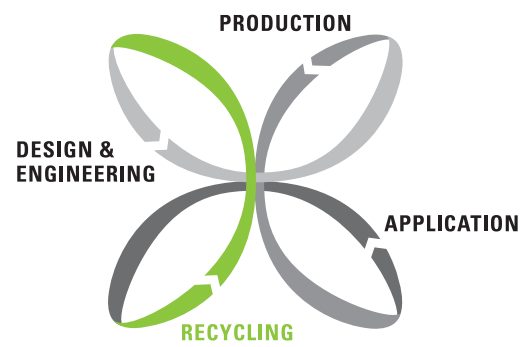
125 W MERCURY VAPOUR		70 W METAL HALIDE		60 W COSMO POLIS	
					
----- 27 m Spacing -----		----- 30 m Spacing -----		----- 31 m Spacing -----	
LUMINAIRE	€ 772.00 (incl. Pole)	LUMINAIRE	€ 867.00 (incl. Pole)	LUMINAIRE	€ 955.00 (incl. Pole)
DESIGN LIFE	20 Years	DESIGN LIFE	20 Years	DESIGN LIFE	20 Years
INSTALLATION	€ 300.00 per Unit	INSTALLATION	€ 300.00 per Unit	INSTALLATION	€ 300.00 per Unit
ENERGY	€ 0.15/kWh	ENERGY	€ 0.15/kWh	ENERGY	€ 0.15/kWh
SPACING ¹	27 m	SPACING ¹	30 m	SPACING ¹	31 m
QUANTITY	37 Units	QUANTITY	33 Units	QUANTITY	32 Units
OPERATING COST	€ 57,936	OPERATING COST	€ 27,282	OPERATING COST	€ 22,776
MAINTENANCE COST ²	€ 15,910	MAINTENANCE COST ²	€ 9,900	MAINTENANCE COST ²	€ 16,640
CAPITAL COST ³	€ 39,664	CAPITAL COST ³	€ 38,511	CAPITAL COST ³	€ 40,160
TOTAL COST	€ 113,510	TOTAL COST	€ 75,693	TOTAL COST	€ 79,576
CO ₂ OUTPUT ⁴ 201 Tonnes		CO ₂ OUTPUT ⁴ 95 Tonnes		CO ₂ OUTPUT ⁴ 79 Tonnes	

¹ Switching Cycle: 10 Hours, Mounting Height: 7m, DIN ME5

² Includes lamp

³ Simple Payback Method

⁴ N. I. C. and Verband Elektrizitätswirtschaft



These die-cast bodies provide mechanical strength and excellent heat dissipation, ideal characteristics for arduous, both low and high temperature applications worldwide.

Aluminium is an 'energy storer', 95% of the original energy required to melt the Aluminium Oxide is also recycled.



RECYCLING

We began with an aluminium substrate that was sourced from 90% authentic, refined, recycled aluminium. At end of life approximately 90% of a WE-EF luminaire is recyclable, based on weight. Materials that can be recycled from the luminaire are as follows

- Aluminium
- Plastic Material
- Galvanised Sheet Metal

All packaging material used by WE-EF are also fully recyclable and contain no dangerous chemicals.

Compliance with WEEE and RHoS also ensure latest standards are adhered to. WE-EF are also members of Interseroh, who handle the recycling of all packaging material.



The 'butterfly' lens is one unique feature of WE-EF's One LED Concept OLC®.

THE NEAR FUTURE

How do we add more value to the WE-EF principle of durability?

WE-EF consider LEDs as a step in the future of value adding to the design life of luminaires, particularly in the area of streetlighting. Longevity is one of the key features of LEDs and it explains why the market perceives LEDs as being a potentially attractive alternative light source. LEDs have been in the market for a long time, mostly within the context of effect and marker lighting, but we are now beginning to see the emergence of LEDs as being a contender to typically HID applications. However, any consideration of LEDs in this context requires thinking of a different kind. There are a number of characteristics unique to the operation and performance of LEDs that WE-EF believe need to be carefully considered first.

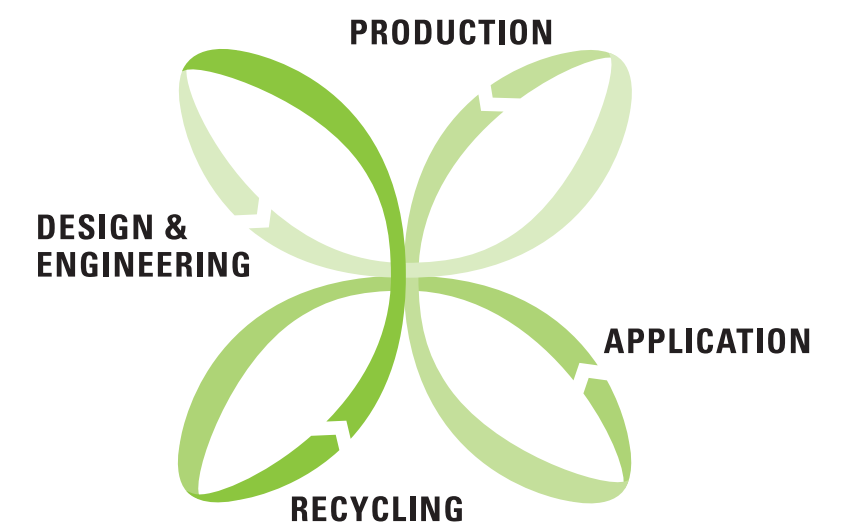
Two major points that require a new kind of thinking are as follows:

- Mechanical and Electrical** - Engineering considerations need to be carefully factored as they can have an even more detrimental effect on LED life than with conventional lamp and control gear. One such factor is thermal management. LEDs are very heat sensitive. They can only operate at optimal efficiency within a particular temperature range, if they are to achieve a long operating life. This is why WE-EF is developing and engineering streetlighting luminaires specifically designed

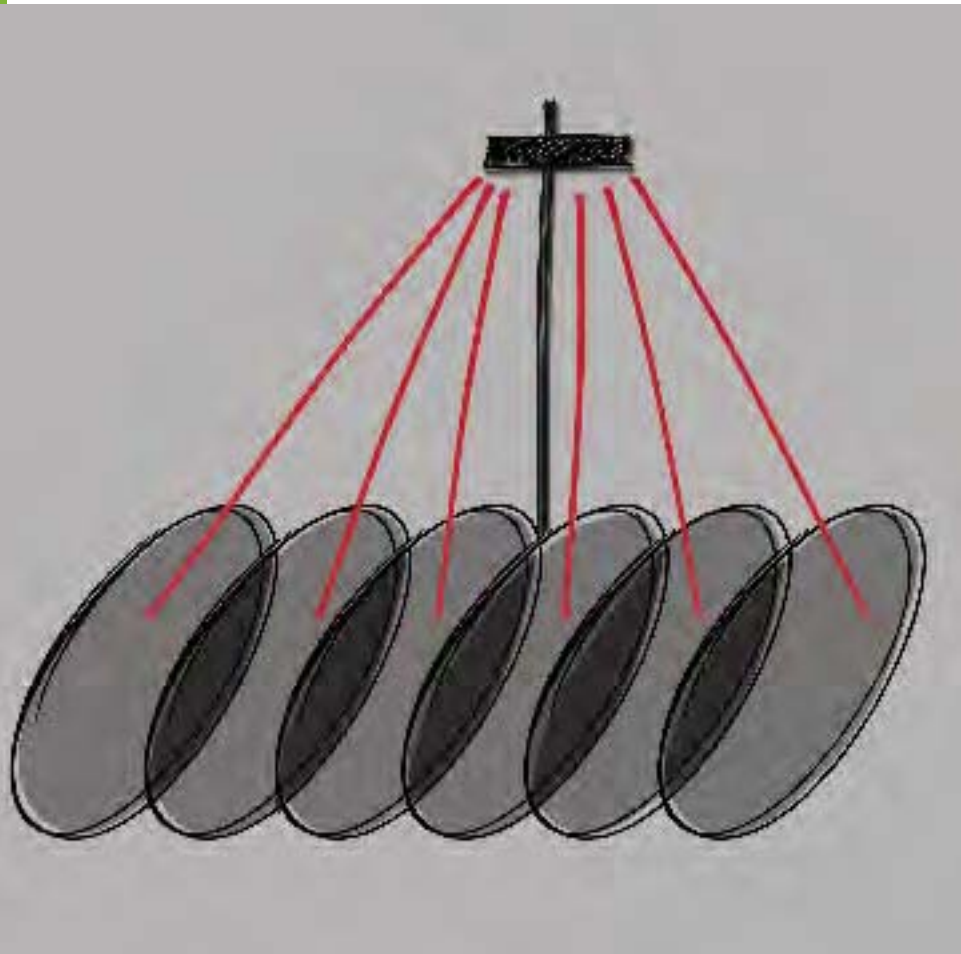
for LEDs. The rules are different for LEDs and so to the engineering.

- Lighting Performance** – Measuring the efficiency of LEDs using the conventional Lumen per Watt method and comparing them to a typical HID light source may not reveal the true picture. This typical measurement is useful when comparing one LED to another, but less so when comparing LEDs to HIDs. LEDs do not behave like a conventional single light source. To achieve the output required for such applications as streetlighting requires currently a cluster of LEDs. The energy, cost or environmental assessment must be based on the entire project. It could be that a single luminaire with a cluster of LEDs may draw more power than a typical single HID Luminaire. However, due to significantly wider spacings and less maintenance with the LED installation, power consumption overall is significantly reduced and therefore output of CO₂.

WE-EF have taken these unique and critical features of the LED and developed the **One LED Concept OLC®**, as a way of capturing and moving the debate on the potential of LEDs forward.



MULTIPLE SPOT



Clusters of LEDs, with various beam angles and lenses are selectively orientated, as a means of achieving an overall uniformity for a single luminaire.

Current thinking: The trend has clusters of LEDs, with various beam angles and lenses, selectively orientated, as a means of achieving an overall uniformity for a single luminaire. We call this the 'multiple spot' technique (see illustration).

One LED Concept: WE-EF does away with this thinking and adopts the 'multiple layer' technique (see illustration). This principle has each single LED illuminating the same area and replicating the same distribution and beam angle. The pattern of light is simply added layer upon layer, until the required light levels are achieved by the required number of LEDs. It may one day be possible, for a single LED in a single luminaire, to achieve a similar outcome. In short, this technique ensures that uniformity is not dependent on an 'x' number of LEDs. Other advantages of the **OLC**[®] system are as follows:

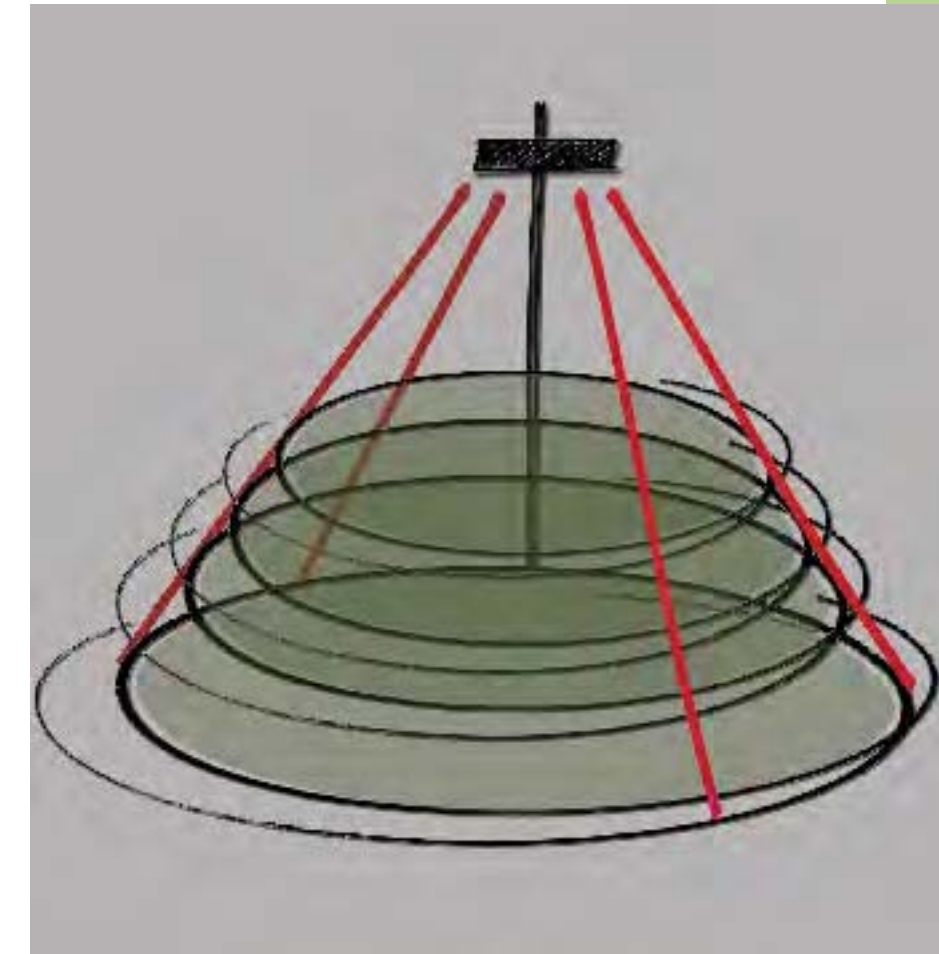
- If one LED fails and the light level drops, uniformity is retained.
- It is possible to simply switch off individual or groups of LEDs to drop the light level, without the need of dimmer or similar control systems.
- The system ensures through modular engineering that blocks of LEDs can be simply and quickly exchanged if there is a failure.
- The same modular system means that when more efficient LEDs become available, they can simply

be retrofitted. The light technical performance remains the same. The **OLC**[®] has been developed with the future in mind.

- Light is strictly controlled and any light pollution is kept to an absolute minimum through the exact aiming of the LEDs. This means excellent glare control and compliance with 'Dark Sky' considerations.
 - Initial **OLC**[®] testing has seen spacings between luminaires increase from between 3 to 4 times pole height ('rule of thumb') to between 6 to 7 times. This is a saving of not just energy, but also luminaires, poles, installation and maintenance costs.
- A win-win situation, which combines the advantages of not only responsible environmental management, but also reducing investment and operating costs.**

More information on the **OLC**[®] principle is available through our Technical Center tc@we-ef.com.

MULTIPLE LAYER



Each single LED illuminates the same area and replicates the same distribution and beam angle. The pattern of light is simply added layer upon layer, until the required light levels are achieved by the required number of LEDs.